SCIENTIFIC AMERICAN

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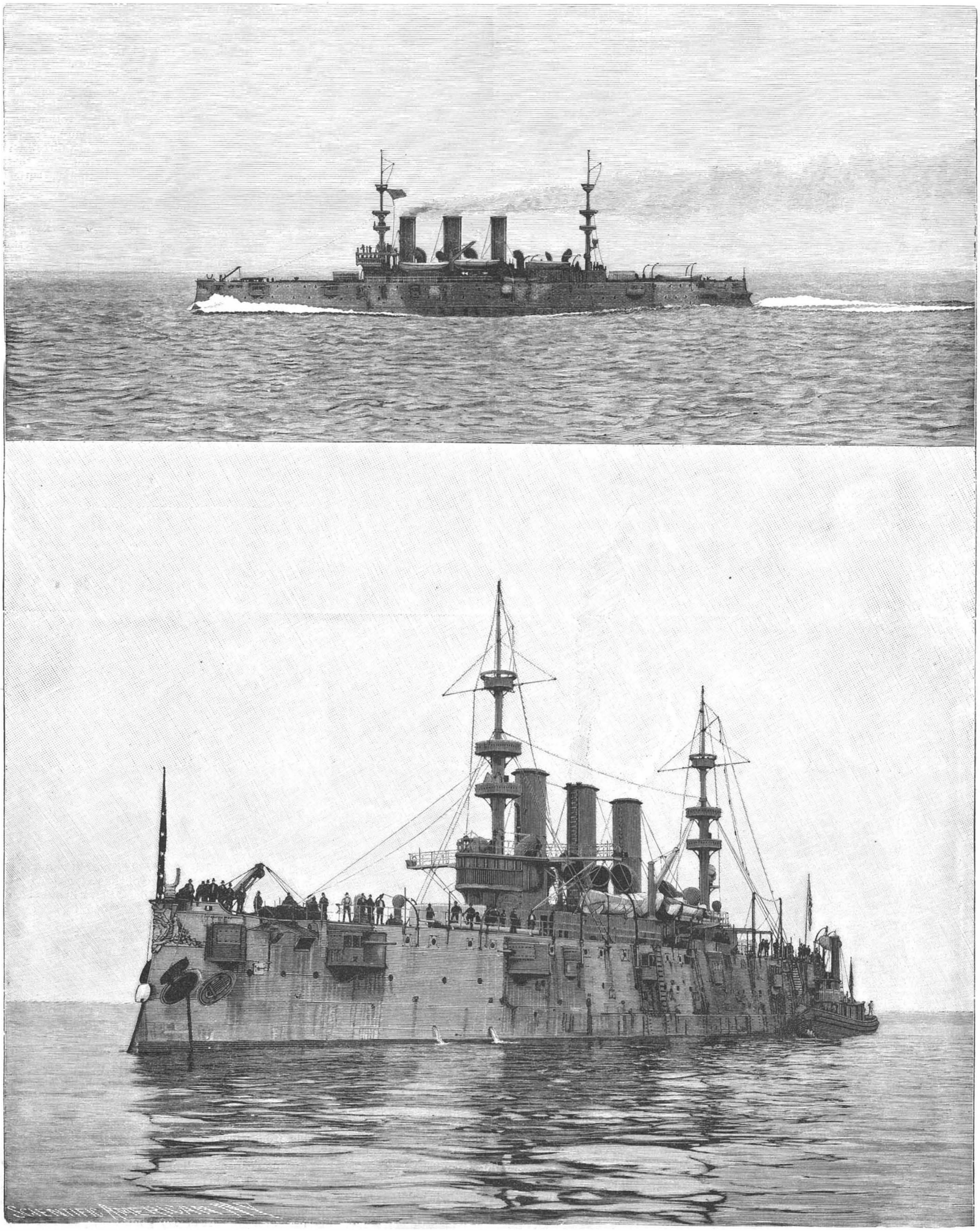

THE NEW ARMORED WAR SHIP NEW YORK—UNDER FULL SPEED AND AT ANCHOR.—(FROM A PHOTOGRAPH).—[See page 375.]

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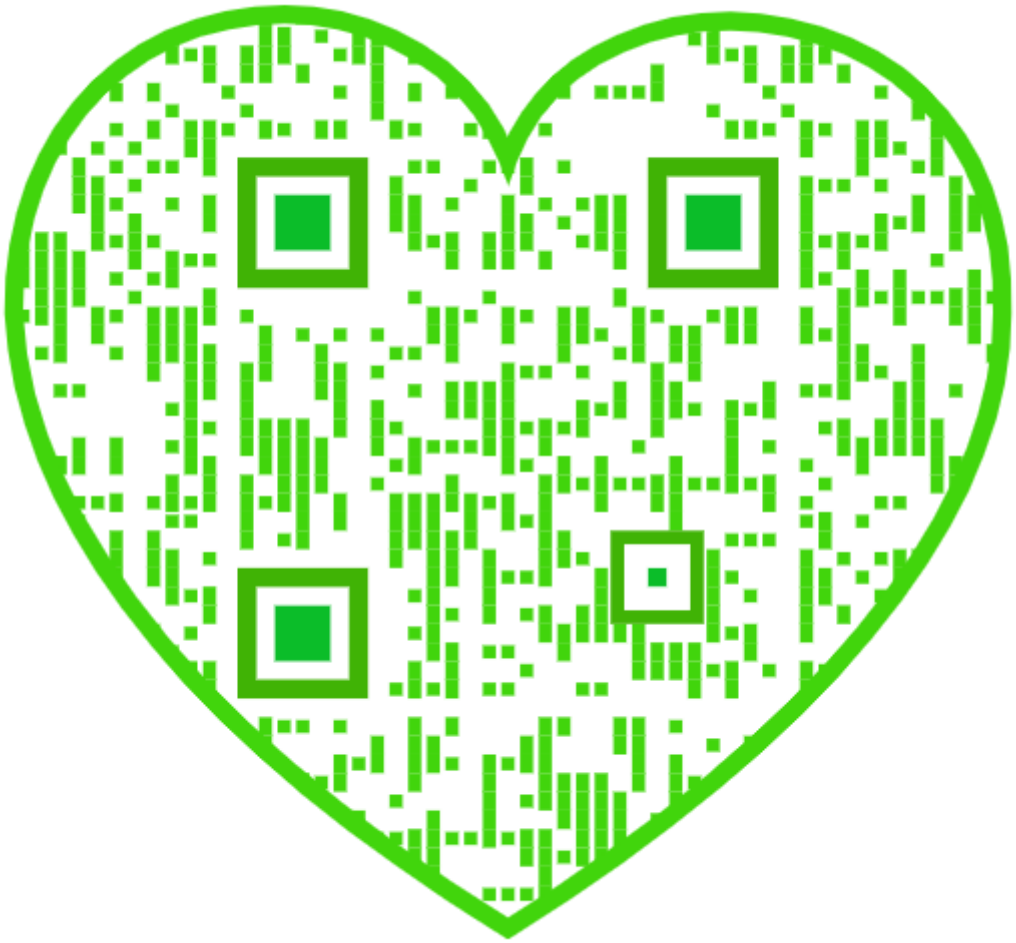

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IF YOU WISH TO BE HAPPY, BE REASONABLE.

Morally, we have no more right to cheat ourselves than we have to practice deception on others. In every profession or business, success depends to a great extent on how one's own status in his profession or business is appreciated by himself. He "must not think more highly of himself than he ought to think," nor go to the opposite extreme by underrating his abilities, and while these remarks apply to men in every occupation, they are now directed more particularly to those who devise new things for the use and benefit of others.

Some inventors are apt to be over-sanguine, and with reason; since no other honorable business yields so large a profit with the same outlay and with as little risk. By some peculiar mental process they induce themselves to believe that an invention is worth thousands or millions of dollars, when the real value may be only hundreds or thousands.

A notion of this kind when adhered to is damaging, and may prevent the inventor from satisfactorily realizing from his labor, whereas by taking a rational view of the case he might gain handsomely.

Two points should be candidly considered by inventors; first, the possible value of an invention, and second, the actual value of capital and influence.

Often, very often, the money invested in promoting an invention, and the business tact and energy which put the invention in commercial shape, are worth far more than the invention itself, and even a first-class invention is greatly increased in value if backed by money and business talent.

Inventors who realize this, and are willing to make reasonable concessions, are most likely to obtain the best returns from their inventions.

Let the inventor for the moment imagine himself to be the other man, the capitalist; would he invest a half million, a hundred thousand, or ten, or even five thousand dollars in such an invention as his own? Let him be honest with himself.

Capital is not invested in patents without the expectation of large returns. Inventors who sell out their interests should not expect all the profits of their invention. This would be like a jobber trying to sell goods at retail prices.

Our advice then to inventors is, "If you wish to be happy, be reasonable."

FARM CHANGES IN ILLINOIS.

An anomalous state of affairs is reported in the farming communities of the State of Illinois. Prospects are encouraging, crops have been comparatively satisfactory of late, and farming lands are steadily increasing in value; yet thrifty and well-to-do land owners, as well as tenant farmers, are moving by scores to Iowa, Nebraska, Kansas and other Western States. The movement, which has been steadily growing for years, is looked upon with some anxiety because of the uncertainty as to what the ultimate result will be.

The introduction of improved methods of farming by the use of machinery of various kinds has made it possible for a man with means and energy to cultivate large tracts—acres by the hundred. Alongside this is another acre-monopolizing tendency on the part of moneyed men to buy up desirable lands and rent them out. These landlords are always ready to add to their holdings, but seldom willing to sell at a reasonable figure. These two tendencies make the lot of the small land owner less desirable than was the case in former years. If the small holder wishes to add to his acres, he finds it quite impossible from lack of means to do so from adjoining farms, and oftentimes from any other land within reasonable distance, at a price within his reach. If, however, he goes to Iowa, Kansas, Nebraska, or other Western States, he finds that he can probably buy five acres for the same amount of money that one would cost in Illinois, and with as many acres at his command as he wishes for, and he finds further that these new acres are as productive as his old ones, that it costs no more to grow his crops, and that transportation rates to market are not appreciably greater. From this point of view the farmer, especially if he has some means, is better off if he leaves Illinois and goes to a State farther west than he would be were he to remain on his old farm.

The cause of the movement westward is evidently not local to Illinois, is not due to worked-out lands, oppressive laws, or other such causes, as much to the improved methods of transportation which practically annihilate distance. But while this westward tendency may be a beneficial thing to those farmers who participate in it, what will be the result in the State of Illinois, which they leave? In the case of a tenant farmer the probability is that another tenant farmer will take his place, although this latter in all probability will be of foreign birth, while the former is more likely of American birth. Land owners who leave Illinois to push westward sell their holdings largely to adjoining farmers who have the means to extend their acreage and who propose to do farming on a more extensive scale, or to landed proprietors who succeed the independent farmer with the tenant farmer.

The question is an old one in Illinois and has had public attention drawn to it at several periods since the organization of the State, but is now assuming a serious phase. The situation is quite different from what it is in New England, where farms have been abandoned for lack of fertility.

IMPROVED TRANSPORTATION.

The inauguration of cable traction on the great thoroughfare of this city, involving the transfer of a line of cars distributed over many miles of the most important artery of the city, shows a new condition of things brought about by the new demands of our increased population. It is but a few years since horse cars were introduced upon Broadway. The storm of protest which they raised and the questionable methods used to obtain possession of the street are in the minds of all. The property owners objected, but the road was put down. It proved of the greatest benefit to all. Now, with larger cars propelled by steam power, in place of the overburdened horses, the Broadway Railroad appears in a better light than ever. In other streets of our city the devotion of two thoroughfares to steam transit will soon be seen. A cable line will run on the natural surface directly under an elevated road. Some day may yet see a three-storied transportation established—tunnel, surface, and elevated.

While this and other cities have been progressing, the country has not been idle. The centralization of power and its distribution by the trolley system have inaugurated a cheap and rapid transportation system for suburban and even rural districts. The country roads have been invaded by the trolley. The vigor of the movement of the day in favor of cheap transportation is here emphasized. In spite of the effects upon horses in frightening them, the country roads on all sides are presented to electric traction companies if they will only put down electric roads.

The cause of the extensive introduction of this class of road is not only to be found in the advantage of centralized generation and power. It is not only the wonderful adaptability of electricity for distributing power that has made the trolley road a winner in competition with the old established steam roads. A single car run at frequent intervals, independent of a published time table, in point of convenience far surpasses the fewer scheduled trains of steam roads. But the free gift to these companies of streets and roads ready graded and prepared for their use is the reason of their existence. Having no extensive right of way to acquire and exempt from the necessity of filling, excavating and bridge building on their line, they possess an enormous advantage in capitalization over the steam railroad.

Simultaneously with the above the movement for good roads has mounted into a national issue. All over the country are heard the calls for better roads. The State of New Jersey, many districts of which are famous for their macadamized ways, is admitting the trolley cars upon these expensive roads. In this there is a measure of inconsistency, unless an adequate breadth of macadamized surface be preserved for the use of teams. The ideal road has been claimed to be a Telford or macadam strip with a trolley line on each side. This provides for those who wish to pay fare, while the farmer can transport his product by the old-fashioned way. It is a self-evident fact that horses must become accustomed to the trolley car.

Already local steam roads have been most seriously affected by the competition with trolley roads. A few years will see the suburbs of all our cities gridironed with these roads. The local business will leave the steam roads. The old mud and sand roads will be soon replaced in these districts by improved Telford and macadamized surfaces. In the cities horse cars will soon be as much a thing of the past as are the omnibuses now. The next generation will only be able to wonder how its ancestors continued to exist under the regime of slow horse cars in the cities, infrequent and expensive train service in the suburbs, with unridable roads as connecting links throughout the country districts.

The Largest Lake Steamer.

The steamship S. S. Curry, which recently has been launched at Bay City, Mich., is to be the largest steamer on the great lakes, but unlike the type of lake steamers which has become so familiar, she will have her machinery amidships instead of well aft. Recent experiences have quite conclusively demonstrated the fact that in vessels of large size constructed on the so-called lake lines, sufficient stability has not been secured. Immense carrying capacity is quite invaluable, from a shipper's standpoint, but lake construction has gone to the extreme of sacrificing stability to carrying capacity. This new vessel is 378 feet 6 inches over all, 45 feet in breadth, and of light enough draught to enable her to pass through the "Soo" canal. The engines will be triple expansion and steam will be used at a pressure of 170 pounds. She is of steel and was built by F. W. Wheeler & Co., West Bay City, Mich.

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Modern Projectiles.

The change from the old-fashioned cast iron balls to the accurate projectiles now required in gunnery is something remarkable. The projectiles made for the United States government by the Carpenter Steel Company, at Reading, Pa., are cast in moulds double the size of the finished shell. They are then hammered into shape in dies and machined, after which they are hardened by secret processes to proper temper and finally finished to exact dimensions, plugs being fitted in to fill the bored-out base of the chamber. If the shells are then truly concentric and balanced, two of each lot are fired at a hardened plate made of open hearth steel, this plate, which is backed by 3 feet of live oak backing, being one and a quarter times the thickness of the shell fired. If the shell penetrates the plate and backing without suffering injury, the lot from which it is selected is accepted. The steel used by the company in making projectiles is a special grade of chrome steel, and is of high tensile strength, the test pieces frequently averaging 110 tons to the square inch, with about 7 per cent elongation.

ROLLING CHAIRS AT THE EXPOSITION.

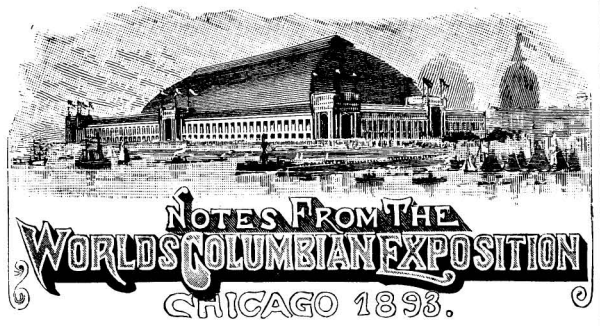
One of the first things to catch the eye of a visitor to the Exposition after a sweeping view, taking in the grounds and buildings as a whole, will be the rolling chairs, which are seen on every side. Not only invalids and ladies, but the tired world in general patronize these conveyances. These chairs, which are 2,400 in number, are provided by the Columbian Rolling Chair Company, and are the only surface conveyances allowed within the grounds. The rates are 75 cents per hour for single and $1 per hour for double chairs, with attendants to perform the manual labor, or if your wife or friend desires your attendance alone, you guiding and propelling the vehicle, the chair may be rented at the rate of 40 cents per hour for single or 60 cents per hour for double chairs. The attendants are all physically capable young men, from the various colleges, who wear a neat blue uniform. Our illustration is from the *American Jeweler*, and was made from an instantaneous photograph.

The Erie Canal Celebration of 1825.

The *Express*, Albany, says: "Magnificent as was the naval review, it had no more significance, nor possibly was it more interesting to the spectators of to-day, than the celebration which took place there in November, 1825, was to the people at that time. It was then that the first canal boat from the Erie canal reached New York. It had as passengers Governor De Witt Clinton and other State officials, and its most precious merchandise was two casks of water from Lake Erie. The boat left Buffalo October 26, and though there were no railroads, telegraphs or telephones then, the fact of its departure was made known in the city one hour and a half later. This was done by means of cannon placed at regular intervals along the entire route of the canal and the Hudson River. The firing of cannon in Buffalo announced the starting of the boat, and one cannon after another repeated the salute, until the last one was heard in New York 90 minutes after the first one was fired in Buffalo. There was great rejoicing. The boat was towed out to Sandy Hook, and the water from Lake Erie was solemnly poured into the Atlantic Ocean, together with water from the Ganges, the Indus, the Nile, the Seine, the Rhine, the Danube, the Orinoco, the La Plata, and other great waterways. Naval vessels of the United States and England took part in the demonstration. The Salamagundi Club is now arranging to take relics of that particular canal boat to the Chicago Fair, and proposes that water from the Atlantic be, in like fashion, poured into Lake Michigan."

Trional as a Hypnotic.

We announced some time ago the introduction of this substance as a hypnotic. It is of the same family group as tetronal and sulphonal, but contains three ethyl groups instead of four in tetronal and two in sulphonal. Dr. Krauss, of Buffalo, in a recent number of the *New York Medical Journal*, describes his results with the drug as very encouraging, although he has used it in only small doses (from eight to ten grains) without repetition of the dose. The patients were all suffering from nervous diseases—such as Graves' disease, epilepsy, neurasthenia, trifacial neuralgia etc.—and in all of them, fifteen in number, except in those in whom peripheral nerve irritation was present, the results were gratifying. In the cases of the patients suffering from neuralgia the combination of trional with acetanilide was followed by sleep. A case of prurigo is the only one in which failure has to be recorded. No bad results followed the use of the drug, and the only apparent objection to its use in the United States is the fact that its producers have patented it and so made it less accessible for ordinary use.—*Lancet.*



The attendance at the Exposition during the month of May as officially reported was over 1,000,000 paid admissions. This gave the Exposition a gross income from this source of about $500,000, although some allowance is to be made for admission of children, as those from six to twelve years of age only pay twenty-five cents. In addition to this source of income there was considerable return from concessions. While the returns were comparatively small during May, the expenses were much larger than they will be during any other month that the Exposition is open. The reduction in the working forces has made a difference of perhaps $5,000 a week, so that it is roughly estimated that during the following weeks the necessary running expenses will not be over $15,000 a week, and possibly not over $12,000.

Thousands of people crowded recently in the evening at the Electrical Palace to witness the unveiling of the tower of light, which is by far the grandest display in electric illumination so far as one piece is concerned that could well be imagined.

COLUMBIAN EXPOSITION—A COMFORTABLE WAY OF SEEING THE SIGHTS.

The model war vessel State of Illinois was also delayed in being formally opened. This exhibit, which is made by the United States navy department, is a very attractive one for people who have never visited the sea coast and have not seen the steel cruisers which have been illustrated in the columns of the SCIENTIFIC AMERICAN. This model man-of-war is constructed after the pattern of the cruiser Oregon. On the evening of the day it was opened the vessel was electrically illuminated and the search lights added greatly to the effectiveness of the illumination. Strong light was thrown upon the vessel from the powerful search lamp stationed on the northeastern corner of the promenade on the roof of the Manufactures and Liberal Arts building.

The fine display of machinery which is made by German manufacturers in the Palace of Mechanic Arts was speeded up on June 1. The exhibit made by the Germans in this department is really very fine, both in the quality and extent. Next to the United States the German exhibit is the most interesting. It includes an excellent showing of electric and power machinery, wood-working machinery, etc. The Mexican exhibit in the extreme southwestern corner of the Manufactures and Liberal Arts Palace is most creditable to that country. It includes specimens of native manufactures, such as clothing, pottery, carvings and the like. Cotton and woolen goods made in Mexico are also shown. Much work is that of the native Indians.

Two State buildings have been dedicated with considerable ceremony, those of Kentucky and California The Kentucky building is purely a club house, but the opening ceremonies were quite elaborate, because in connection with them was the unveiling of a monument to Daniel Boone. The California building is one of the largest State buildings on the grounds. In appearance it is far ahead of most of the State buildings; in fact, California has made a much finer display than any other State excepting possibly Illinois. The building is a reproduction of the old mission station at Santa Barbara. Much taste has been displayed in laying out the grounds around the building. Inside there is a splendid display of the products of the State.

On June 1 the Children's building at the Exposition was formally opened with appropriate exercises. The scheme of erecting the building and arranging its use was the work of the ladies connected with the Exposition management. There was no money, however, that could well be used for this purpose, and the first question was to raise the funds. Some of the generous ladies of Chicago held a grand bazar and in other ways secured more than enough money to carry out the idea. There has been collected in this building a great variety of toys, playthings, books and all devices adapted to the purpose of entertaining and educating children. The Japanese took much interest and sent many contributions. A *creche*, with a checking system, so to speak, is established, so that women who wish to attend the Exposition, and have no particular means of caring for their young children, can bring them to this building and have them properly looked after. Another line of usefulness shows the different systems of educating children in the kindergarten work and in kitchen gardening. Every facility is at hand for accomplishing these and other lines of work for educating children. The roof of the building is arranged as a sort of playground, and in the center of the building on the first floor is a gymnasium where the children indulge in calisthenic exercises. Sloyd and physical culture are included in the work. This building is located between the Woman's building and the north end of the Horticultural building.

As to musical entertainments, the programme during the month of May included twenty free popular concerts, twelve symphony concerts, three musical festivals and three chamber concerts. The programme for June includes four Russian concerts, Handel's "Messiah," Bach's "St. Matthew's Passion," concert by the Exposition festival orchestra of 150 pieces, Gounod's "Third Mass," three grand festivals of 1,500 voices and 200 instruments with eminent soloists, Brahm's "A German Requiem," concert by the Brooklyn Arion Society, Handel's "Messiah," Bach's "St. Matthew's Passion."

A GENERAL GLIMPSE AT THE EXPOSITION.

A correspondent gives his impressions as follows:

The facilities for reaching the Fair grounds are at the present time more than sufficient to carry the visitors. The elevated railroad is in fine running order, and takes the passengers directly into the grounds; but the running time is rather long, owing to the distance and the number of stations. The steamers also require a long time to make the trip; but if the visitor's time is limited, the World's Fair express trains on the Illinois Central offer a quick and cheap method of reaching the grounds. The open cars are familiarly called "cattle cars," but they will prove very acceptable during the heated term.

The 64th Street gate is, in many respects, the most pleasant entrance to the grounds, and is the nearest entrance for the Administration and Manufactures buildings. The visitor buys his ticket at the little ticket booth and passes through the turnstile. As there are turnstiles for passes, workmen, and children, as well as the regular ticket gate, there may be some trouble in finding the proper gate the first visit. Once past the turnstile, and the visitor will make his first acquaintance with a unique feature of the Exposition—the Columbian guard, who is without the power of making an arrest, for they can only summon the patrol wagon, which carries a city policeman, and who is without a club for defense, though they have a preposterous little sword. Still the guard's uniform is pretty, and they serve to give a little color to the scene. The guards are polite, and on the whole do not deserve one-half the fun poked at them by the papers, which, in many cases, is the result of ill-nature on the part of reporters. It appears to have been the aim of the directors to put everybody in uniform. The guards are dressed in blue, as are also the sellers of the official guide. The official catalogue boys have a distressingly bright red uniform, while the guides are habited in gray, and the chair pushers (a handsome body of young men) in a light blue uniform, which ladies would describe as fetching. Every one connected with the Fair must march, and it is very amusing to see the ticket takers leaving the turnstiles and marching two by two with their big tin boxes. The central railroad station, near the 64th Street entrance, is a large structure, and

(*Continued on page 374.*)

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ENGLISH GOLDSMITHS' WORK FOR THE CHICAGO EXHIBITION.

The Goldsmiths' and Silversmiths' Company of London have sent several beautiful examples of their art and manufactures to the great International Exhibition in the United States. The subjects of the illustrative designs being of high interest both to England and to America, we proceed to describe these works, and briefly to explain the representations in our engravings.

THE COLUMBIAN SHIELD.

Made entirely of solid silver, panels modeled and chased in high relief. Scenes of the discovery of America by Columbus, the squadron in the port of Palos receiving a priestly blessing, Columbus in his vessel pointing out land to the mutinous crew. In center medallion the raising of the Spanish flag on the American shore; above, the reception of Columbus, on his return, by King Ferdinand and Queen Isabella of Spain; to right and left, seated female figures, one with a horse, the other with a bison, emblematic of Spain and America; below sits a figure holding the model of a ship, symbolical of Navigation. The border of the shield decorated with various American plants and flowers, at the top a medallion portrait of Columbus, and the American eagle, with the flags of Spain and of the United States.

THE COLUMBIAN SHIELD FOR THE CHICAGO EXHIBITION.

THE SHAKSPERIAN CASKET,

made of eighteen-carat gold on an iron body, with parts damascened; rich gold mouldings, two gold medallions, six framed enamel paintings; stands on four gold and damascened feet. The front contains, in the center, Shakspere's portrait, from the bust in Stratford Church, and two enamel pictures—namely, those of Titania caressing Bottom with the ass's head, while Puck and Oberon are approaching; and Prospero, with Ariel, at the entrance to the cave, watching Ferdinand and Miranda. On the back of the casket is a view, in gold *repousse* work, of Shakspere's birthplace, with two enamel pictures, one of which is that of King Lear with his daughter Cordelia, the other is Romeo with Juliet in the moonlight balcony scene. The pictures at the ends of the casket show, respectively, Othello telling his warlike adventures to Desdemona and her father and a scene in the "Two Gentlemen of Verona." The lid is elaborately ornamented with charming details; on the summit is Shakspere's crest, the falcon holding a lance; the figures reclining below it are Poetry and Dramatic Art; the masks of Tragedy and Comedy occupy separate medallions. At the base of this casket is a surrounding series of twenty-four subjects from different plays by Shakspere, "The Tempest," "Macbeth," "Measure for Measure," and the "Comedy of Errors" contributing the subjects in front. Every part of the manufacture, including the damascened patterns and arabesques of rich and various device, is British workmanship.

CLOCK FOR THE CHICAGO EXHIBITION.

THE CLOCK FOR AMERICA.

Octagonal pedestal, made of the finest American walnut wood decorated with brass ornaments elegantly chased and richly gilt. The columns of the pedestal surmounted by heads of American animals. In the upper panels of the pedestal are the medallion portraits of Franklin, Presidents Washington, Jefferson, Jackson, Lincoln, Grant, Harrison, and Cleveland. The lower panels display the sports of running, leaping, swimming, trotting, yachting, base ball, and cycling, and a view of Brooklyn suspension bridge. Twelve figures of players in these and other athletic exercises, wrestling and boxing, riding, rowing, shooting, tennis, cricket, and foot ball, stand on the top of the pedestal around the base of the clock. The four sides of the clock are guarded by figures which personify Art, Science, Industry and Engineering. On the top is Fame. The clock is musical, playing chimes and the English and American national anthems. The twelve figures of players revolve around it with the chimes.—*Illustrated London News.*

SHAKSPERIAN CASKET FOR THE CHICAGO EXHIBITION.

VIENNA AND CHINA IN JUXTAPOSITION.

It is probable there was never brought together within the same space such a curious, wonderful combination of extraordinary scenes as are presented on the Midway Plaisance at the World's Columbian Exposition. All sorts of strange people, with strange belongings, from the uttermost parts of the earth—from Europe, Asia, Africa, Australia, the islands of the seas, from the icy poles to the heated tropics, are there collected. In future issues we expect to illustrate several of the most striking of these objects. At this time we give a view of that portion of the Plaisance where some of the quaint buildings of old Vienna are reproduced on one side, while a Chinese theater has been erected upon the opposite side. To the Chicago *Record* we are much indebted for our illustration.

THE WORLD'S COLUMBIAN EXPOSITION—THE MIDWAY PLAISANCE NEAR STREET IN OLD VIENNA AND CHINESE THEATER.

Underwriters' New Electric Rules.

The new rules are the result, with slight modifications, so says the *Electrical World*, of the deliberations of underwriters' experts held in New York City last August and December, whose meetings also resulted in the formation of the Underwriters' International Electric Association—a body with a well-defined field of usefulness before it. With some important exceptions, the rules are those formulated and adopted by the National Electric Light Association, the departures being in the direction of greater stringency. Among the radical and commendable features are the prohibition, by implication, of wooden cleats and the requirement that all telegraph, telephone and similar conductors shall be provided with some protective device where they enter a building, to obviate danger from cross currents. The requirements that *all* safety fuses must be stamped or otherwise marked with the number of amperes they will carry will greatly abridge the use of fuse wire; while this is greatly to be desired for the larger sizes, it is very questionable if it should be made to apply to the smallest sizes, such as are used in ceiling rosettes and fixture cutouts. Another prohibition, fortunately of little practical moment, is against the use of multiple-series or series-multiple lighting, which, we presume, does not apply to the use of incandescent arcs, although they are not excepted. We note that the smallest gauge of wire that can be used outside of conduit tubing and fixtures is reduced from 16 B. & S. to 14 B. & S., and that the use of staples is absolutely prohibited. The requirement of a double-pole switch for a single light on a gas fixture will prevent the use for this purpose of a number of special switches now on the market, and those in regard to electric gas lighting will prevent the use of many of the present forms of electric burners on the same fixture with electric lights. We do not find any reference in regard to the use of flexible cord pendants in places like textile works where there may be an accumulation of highly inflammable material on the lamp cord. It is a matter of no uncommon occurrence for flexible cords to be ignited, without blowing a fuse, and while they are required by the rules to be covered by a non-inflammable layer, yet sufficient heat may be generated to render their use dangerous in the cases referred to. The cause of the accident in question is obscure, but it nevertheless exists, and one underwriters' association, at least, required under the circumstances named that the pendants should be of solid No. 18 B. & S. wire. Taken as a whole, the rules are characterized by sound common sense and show a due appreciation of the interests of those to whom they are to be applied. Their general adoption now rests with the various insurance companies and associations interested in electrical risks, and it is most sincerely hoped that these bodies will take speedy action toward their adoption, and thus remove a reproach to electrical inspection which has heretofore existed on account of the number and disparity of independent rules in existence.

OF the human race, 500,000,000 are well clothed, that is, wear garments of some kind that will cover nakedness; 250,000,000 habitually go naked, and 700,000,000 only cover the middle parts of the body.

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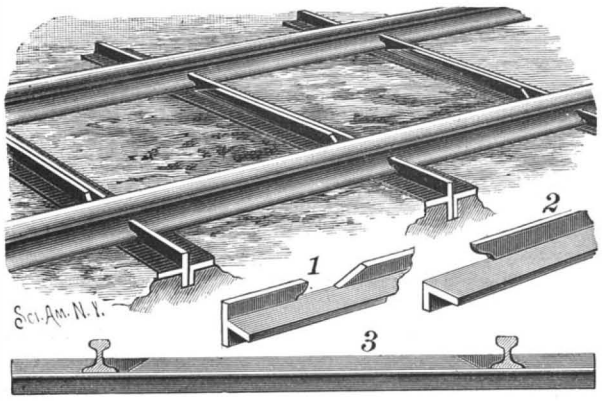
AN IMPROVED METALLIC RAILWAY TIE.

This tie, patented by Mr. Samuel McElfatrick, of Princeton, Ky., has but little metal, but the metal is so disposed as to make the tie very strong and yet admit of its being cheaply rolled. The tie may be quickly placed in position to support the rails and hold them firmly in place without the use of bolts or spikes.

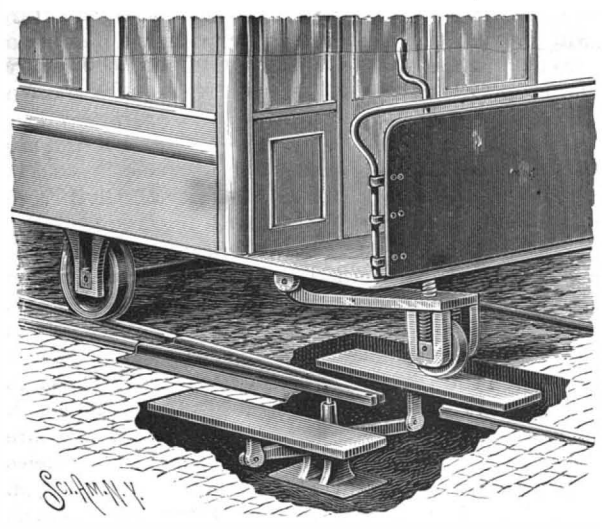


McELFATRICK'S METALLIC RAILWAY TIE.

It is composed of two substantially similar parts, of a general T shape in cross section, the flat or top portions of the parts fitting together, a flat web portion lying upon the ground, while a vertical web at right angles extends below and above the rail flanges. In one of the parts, as shown in Fig. 1, the upper vertical web portion is cut away near opposite ends to form a recess to receive the rail, over the outer flange of which a portion of the web is shaped to fit snugly. In the other part, which may be designated as a straining bar, the upper vertical web portion is sufficiently cut away at the ends and shaped, as shown in Fig. 2, to fit snugly over the inner flange of the rail. Fig. 3 shows how one part of the tie body is first placed beneath the rails, after which the other part, or straining bar, is applied, the latter being driven inward to snug position, when the depending rib is embedded in the roadbed, the two parts of the tie being thus held so closely together that no fastening bolts are necessary.

A SWITCH OPERATING DEVICE.

The improvement shown in the illustration is especially adapted for use on cars of cable railways,



BARTELMES' SWITCH OPERATING DEVICE.

where the road is intersected by lines on which cars are drawn by horses, and the switching of the latter cars from and to the cable track may be the cause of accidents from the leaving open of switches from the cable road to the divergent side tracks. The improvement has been patented by Mr. Benjamin Bartelmes, No. 89 Graham Avenue, Brooklyn, N. Y. Upon a standard in a pit below the track is pivoted a transverse beam having at its ends upwardly extending pivoted arms, each supporting a table or platform on a level with the pavement, at either side of a rail of the main track. The switch rail, located over the pit, has a pivotal connection with a post extending upwardly from the center of the transverse beam, so that the alternate depression of the tables will vibrate the tongue, swinging its front pointed end toward either side, to align its edges with either a main cable track rail or a side rail. Should a street car horse, guided by the driver, step on the outside table to align the cable track with a diverging side track, the cable road would thus be left open at the switch. To close the switch in such case a heavy presser bar is pivoted upon the lower side of the car, its front end near the edge of the platform, and carrying two bracket arms in which a presser wheel is held upon a spring-pressed shaft. The presser bar is moved up or down by an adjusting shaft on which is a coarse-threaded screw engaging a nut in the car platform, the shaft being operated by a crank on its upper end. The gripman of a cable car, to close an open switch in front of the car, adjusts the screw shaft to cause the presser wheel to bear forcibly upon the central table, and thus moves the switch rail to close the switch and render the line intact for the cable car. By reason of the spring pressure upon the wheel, no harm is done when it strikes the solid roadbed, and sufficient time is afforded the gripman to lift the presser bar and wheel by turning the crank of the adjusting shaft.

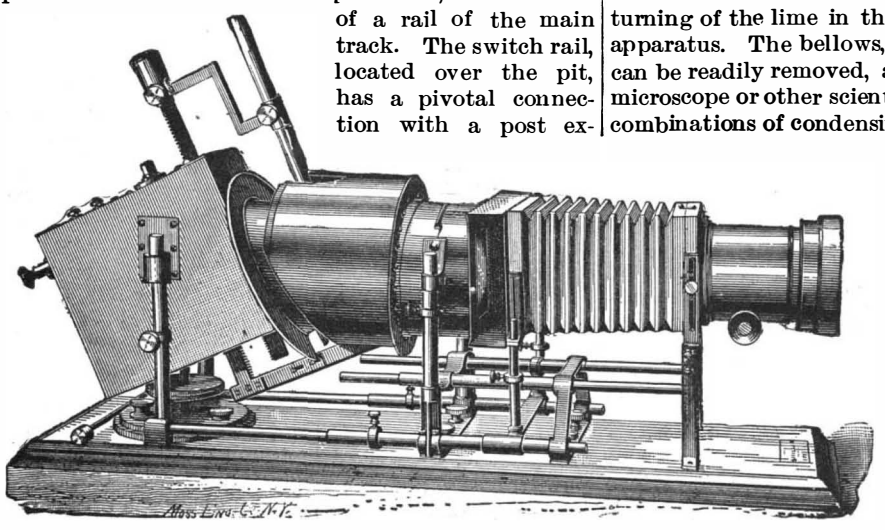
Contagiousness of Consumption.

Dr. J. G. Hopkins, of Thomasville, Ga., read a paper on this subject which is reported in part in the *Medical Record*. The speaker said he had joined the growing army which placed tuberculosis in the category of contagious diseases, and his experience with this disease during nineteen years of investigation in Thomasville—which place is a resort for consumptives—bore him out in his opinion, and made a willing subject of the great and erudite Koch. He does not doubt but that all men, women, and children, at some time or times, receive into their air passages the tubercle bacilli, but fortunately the great majority possessed the power of repelling them and throwing them off—they did not find that soil, so to speak, which is adapted to their growth. Indians in a state of nativity seemed impervious to the germs of consumption, but were now dying by thousands on the reservations. The whites and the blacks in prisons all over the world labored under similar conditions. A report from the Illinois State Prison, at Joliet, says that there are 1,400 convicts within the walls, and fully one-third of them have consumption in a light or bad form. Nearly all deaths of persons in the penitentiary have been caused by consumption.

Dr. Hopkins emphasized the danger that lurks in sleeping cars, in carpets, bedding, clothing, and in the walls of apartments occupied by consumptives, which have not been properly renovated and rendered harmless by antiseptic measures. Consumptives should be forced to provide for the destruction of sputa. Whenever situated so as not to expectorate directly into a germicide or the fire, they should use some means of conveying the sputa to the germicide or the flames. If handkerchiefs or clothes are used, they should not be sent to the laundry, as human happiness and life are jeopardized through the probability of inoculation through abrasions upon the hands. These bacilli should never be allowed to dry up and impregnate the air, as is now done through ignorance of possible result. Numerous experiments by leading medical authorities have proved beyond doubt that consumption is an inoculable disease, and so rapidly is the throng of converts growing that the speaker would not be surprised if even in his day resorts now soliciting the patronage of the consumptive will be quarantining against him.

AN ELECTRIC LIGHT LANTERN.

The illustration represents one of the best forms of electrical lanterns for exhibition purposes, such as used at the Metropolitan Art Museum, New York, and other places where the best effects have been obtained. It is very simple in its operation, and the adjustment of the carbons is no more difficult than the occasional turning of the lime in the well known oxy-hydrogen apparatus. The bellows, front and objective supports, can be readily removed, admitting of the use of the microscope or other scientific attachment, and various combinations of condensing lenses may be used as desired. This lantern is made by Messrs. J. B. Colt & Co., of No. 16 Beekman Street, New York City.



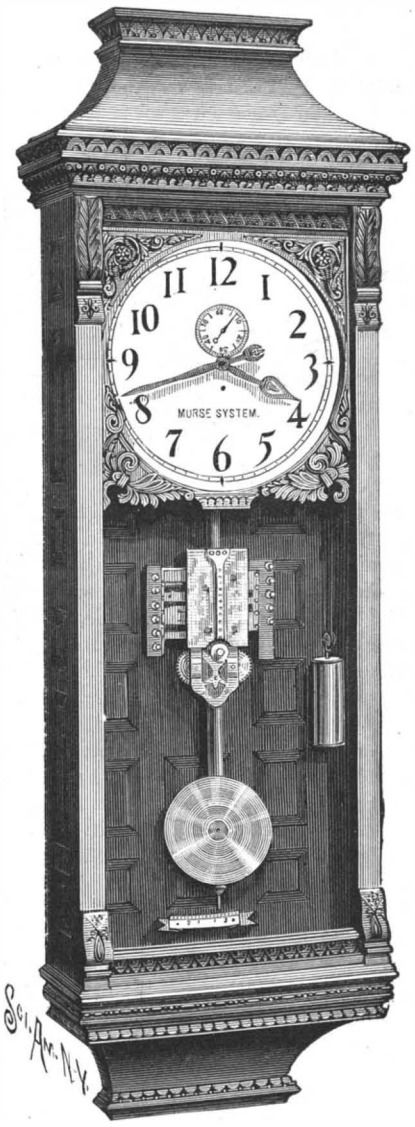
THE "CRITERION" ELECTRIC LIGHT LANTERN.

Success of the New Orleans Jetties.

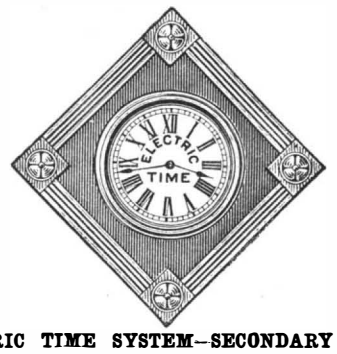
By the survey just completed by the government engineer, Major Quin, it appears the pass has more water than was required by the contract of the Eads Jetty Improvement Company, and is in the condition required by the act of Congress, being over 26 feet through all its length and 30 feet on the bar.

AN ELECTRICALLY REGULATED TIME SYSTEM.

One of the most satisfactory of all the systems which have been devised for the regulation and maintenance of uniform time throughout the various rooms and buildings of a factory, or in different departments of any extended business, is that which has been perfected by the "American Watchman's Time Detector Company," J. S. Morse, Superintendent, No. 234-5 Broadway, New York. The system comprises a self-winding regulator, as shown in our illustration, to be placed in the main office or some central and conspicuous position, and any desired number of secondary clock dials placed in the various rooms and departments and electrically connected with the central regulator. There is no winding to be done to the secondary clocks, neither do they require setting or cleaning, as the driving and setting is all done from the regulator, and there is nothing to clean, there being only two wheels in the secondary. These secondary dials are made in sizes varying from ten to thirty inches in diameter, and the hands move only once a minute, but with a certainty that they are in exact accord with the time of the regulator. The regulator has a full length pendulum, which beats seconds, and it is wound by electricity; that is, it is self-winding. The circuits are so connected that every dial can be set by means of a key in the regulator. A gauge is also connected in circuit, showing the state of the battery and so adjusted that when the battery becomes at all weakened through use or otherwise, the bell will tap every minute until the battery is put in order. It is said that there are hundreds of instances where the dials have been in use for years without ever giving inaccurate time. The advantages of such a time system are obvious for any extended business, embracing numerous departments where a uniform standard is not easily obtainable from a number of separate timepieces, even if these be of the best class.



ELECTRIC TIME SYSTEM—SELF-WINDING REGULATOR.



ELECTRIC TIME SYSTEM—SECONDARY DIAL.

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NOTES FROM THE WORLD'S COLUMBIAN EXPOSITION.

(*Continued from page 371.*)

the terminal facilities will be ample for some time to come, if the railroads do not alter their policy.

The Transportation building being near the entrance attracts a great deal of attention and deservedly so, for the exhibits are wonderfully complete. The Mines building is worthy of considerable study; the center of attraction is, of course, the silver statue of Ada Rehan. In the galleries are several fine collections of minerals, including an exhibit by the Messrs. Tiffany and a portion of the private collection of their gem expert, Mr. Kunz, who has brought on his splendid collection of books, pamphlets, etc. The machinery exhibit is not equal to that of the Centennial as regards the actual processes of manufacture which were shown in 1876, though, of course, the electrical features largely compensate for this loss. The Administration building on the whole is rather disappointing and suffers by comparison with the Administration building at Paris, in 1889. The gilding on the dome appears dull, but at night the effect produced by the incandescent lamps and the huge gas torches is superb.

Standing at the MacMonnies fountain and looking toward the statue of the Republic, with the Peristyle and blue lake beyond, some idea is obtained of the wonderful harmony of the group. There is nothing incongruous, and the proportion of each building, when considered in reference to the next, would lead a stranger to believe that the whole group must have been the creation of one mind. It is safe to say that never, since the time of the grandeur of Rome, has there been such a remarkable collection of buildings grouped together. When the sun shines on the buildings, the effect is superb. Music floats over the water from one or the other of the two band stands, the noiseless little electric launches speed hither and thither, the gondolas propelled by swarthy Beppo and Espero, from the Grand Canal, glide past—the picture is almost too beautiful, and the half hour spent in the contemplation of the glorious and ever-changing panorama is indelibly fixed upon the memory. At night the scene is, if possible, even more grand, with the buildings outlined in incandescent lamps and amid the glare of the gas torches, which are occasionally paled by the search lights. A gondola ride at night is something not soon forgotten by the untraveled, while to those who know Italy it brings back memories of the Piazetta and the gorgeous moonlight nights for which Venice is justly celebrated.

The Agricultural building is slighted by many who use it as an approach to either the Monastery and Krupp's exhibit or in the midday trip to the Casino. The Manufactures and Liberal Arts building is so large that an idea of its size can only be obtained by a trip to the top of the building. The elevators run through one of the great coronas of arc lights. The view from the top is the finest which can be obtained in the grounds. The exhibits of the great building would require a long time to study in detail. The exhibits of Germany are particularly attractive. The prices of articles are very reasonable and the Exposition affords a good chance to pick up bric-a-brac at moderate prices. The educational exhibit is very interesting, the exhibit of the German universities being particularly so. There is a patrol day and night under the floors of the great building, safe deposit vaults are provided at each end of the building at moderate rentals. Skipping the Government building, it is a pleasant walk over the Wooded Island to the Fisheries building, or rather it might be a pleasant walk if the walks were in a proper condition. The walks all through the grounds with a few exceptions are made either of gravel or broken stone, which hurt the feet cruelly when the feet have been rendered tender by the enforced walks, for the facilities for getting around the grounds are inadequate, the electric launches perhaps being the most useful means of locomotion. The intramural railroad is a fine road, but only skirts the grounds, affording a fine view of the "back yard" of the Exposition, which it is just as well that the visitor did not see. The beauty of the Fisheries building is rather in its architecture than in its contents. The Government building and the brick man-of-war are thronged all day long.

Victoria House, to which the public, with true British exclusiveness, are not admitted, cost $120,000 and holds a priceless treasure, or rather curiosity, a London policeman direct from the wilds of High Holborn. This interesting creature is so hedged around with Columbian guards that it is difficult to get a view of him. The exhibit of the city of Paris, showing the way the city is drained, cleaned, policed, etc., is very interesting, and the method used in identifying criminals attracts a great deal of attention, but ladies shun the gruesome-looking camera which is used to photograph the dead in the position they were killed.

Near the Fisheries building is an odd-looking construction all covered with towers. This is the marine cafe, which supplies marine food only, and enjoys with the Casino the distinction of being the best restaurant on the grounds. The prices for all eatables in the Fair are high, but not, perhaps, unduly so, considering the inevitable percentage which the administration receives on all eatables, modes of locomotion and amusements. The revenue of the Fair from popcorn and soda water alone must be enormous. An unjust cause for complaint is the charge of one cent a glass for spring water, which is brought by pipe from the Waukesha spring and refrigerated on the grounds, clean glasses being supplied by the attendants. Distilled water for drinking purposes is provided free of charge.

The Art galleries and the State buildings afford pleasant places to rest. The art collection is uniformly good, though there are few pictures before which groups of people linger as they did at the Centennial. The United States collection is very fine, though there are some names which should have appeared, like Remington's. Blashfield's Christmas Bells in the first room of the United States section attracts numbers of visitors by the excellence with which the patina on the bell is rendered, as well as by the composition. Boys in their fiendish suits of red, selling catalogues, are a public nuisance in the Art building, and their loud voices should be suppressed at once.

One curious feature about the State buildings is that the buildings of the East make little or no display of products, etc., and deal purely with the social side, while the mania for exhibition increases as we go West, and the buildings become larger, wilder, and "more woolier," until it culminates in the enormous shed called the California building.

The Esquimaux Village is very interesting, and is in the main inclosure. The inhabitants snap coins out of the ground with long dog whips, to the infinite delight of the spectators.

The Plaisance is a delightful place to spend an hour or two after fatiguing sight-seeing. The Ferris Wheel may be the center of attraction later on, but at the present time the Cairo Street and the Dahomey Village vie with each other to see which can sell the most tickets. Once inside the magic inclosure and we are transported to Egypt, and in a moment we are surrounded by camel drivers, donkey boys, and urchins, and yells of "Yankee doodle donkey, Bismarck donkey, Gladstone donkey, you no 'fraid," are heard ceaselessly. The Nubian, the Cairene, and the Soudanese elbow each other in their efforts to get money. The scenes in the street are very picturesque, and the street well repays a daily visit. The Dahomey Village is very popular, and the Amazons' dancing is very curious, to say the least, while the color of these people is superb, being a rich chocolate brown. The Chinese theater and orchestra make day and night hideous with horrible sounds, and it is to be hoped that a similar orchestra in the Celestial Empire, or any other well regulated country, would receive condign punishment. The Hagenbeck animal show still draws large audiences, and the mournful-looking lion who rides a bicycle elicits peals of laughter. Let us take a Sedan chair and return once more to the 64th Street entrance, where our "cattle train" awaits us.

The Fair is a wonderful creation, and should be visited by every one, without regard to idle newspaper stories of extortion. Chicago covers an enormous amount of territory, and if there are not hotels enough, Chicago will build more. And there is another reason why all should go—the Fair needs the money.

The Columbus Building, Chicago.

One of the most attractive buildings architecturally that has recently been constructed in Chicago is the Columbus Memorial building, which stands on the corner of State and Washington Streets. This building is fourteen stories high, and the material of which it is built is terra-cotta. On the corner of the building is a tower rising considerably above the roof, and at the top of this tower is a large globe representing the earth, with ribs on it denoting the equator, tropics and other meridians, and inside the globe is an arc lamp of 15,000 candle power which burns each night. From the height of the globe from the ground and the location of the building, this light is a conspicuous beacon for a long distance from out on the lake as well as in the suburbs of the city.

In addition to the somewhat novel feature of this lamp in the globe, there are interesting features in connection with the electric plant which has been installed in the building. The engine is a 300 horse power high speed engine, and it runs two dynamos of sixty kilowatts each, and another dynamo of forty-five kilowatts. This plant is installed in the basement, while up in the fourteenth story is the largest electric storage plant that has yet been installed in Chicago, if not in the country. This storage plant consists of two complete sets, one of 174 cells of 300 ampere hours, 110 volts, the other of 96 cells of 300 ampere hours, 50 volts. The battery of 96 cells is used solely for running the 15,000 candle power arc lamp in the globe, while the 174 cell battery is used for the public lighting in the building, that is, for lighting the halls, stairways and other parts that the owners of the building provide lighting for. The forty-five kilowatt dynamo is shunt wound, and is intended especially for charging the storage batteries. The storage battery complete, with the 270 cells, weighs twelve and one-half tons. The arc lamp which supplies the light in the globe has been specially constructed for this purpose; it uses a carbon an inch and a half in diameter.

In Europe storage batteries are used extensively, but heretofore they have not been popular—nor have they been an entire commercial success—in this country. For this reason the success of this plant in the Columbus Memorial building will be watched with much interest. Two small storage battery plants have been used in Chicago for lighting purposes for a year or two, but what their efficiency or commercial success has been is not known.

Demonstration of Sound Waves.

Prof. V. Dvorak, of Agram, *Nature* says, "uses a very simple apparatus for demonstrating the oscillation of the air in sound phenomena. In an ordinary resonating sphere the short neck is replaced by a small metal plate with a conical hole opening inward, its shortest diameter being about 2 mm. When the resonator sounds, the passage of air through the hole is strong enough to extinguish a lighted match. If a small paper wheel resembling a water wheel is placed a little below the opening, and the resonator stands about 3 cm. in front of a wall, the blowing of a horn, or the singing of the proper note, is capable of setting the wheel in rapid rotation. A very serviceable lecture apparatus for measuring the intensity of sound is illustrated in the *Zeitschrift fur Physikalischen Unterricht.* A narrow glass tube bent at a very obtuse angle is half filled with alcohol. One end of the tube has a conical opening, and this is placed at a distance of 0·5 cm. from the opening of the resonator described. The whole is mounted on a board capable of adjustment to any angle. The puffs emitted from the resonator when responding to a sound affect the level of the alcohol, and the displacements are read off on a scale attached to the tube, projected, if necessary, on to a screen. Another effect of sound easily observed is that of repulsion. A light resonator of the ordinary construction is floated on water, its axis being kept horizontal by means of an attached piece of wire. On blowing the horn, the sphere will float in the direction opposite to that in which the neck is pointed. To produce continuous rotation, four resonators are attached to a light cross of wood turning on a needle point, or one resonator with four bent necks is suspended by a thread. If this acoustical reaction wheel is placed in one corner of the lecture theater, it can be set rotating from the opposite corner by a strong tuning fork, or even by singing through a conical tube."

Solid Magnesia Fire Bricks.

At a recent meeting of the Society of Civil Engineers, Paris, a discussion took place on the possibility of obtaining higher temperatures in steel furnaces. At present the temperature is limited by that at which the walls of the furnace begin to fuse, and even Diners fire bricks are not proof against this. Magnesia is claimed to be capable of standing far higher temperatures than the Diners brick. It is used, according to a statement made at the meeting referred to, by M. Lencauchez, and was first proposed by M. E. Muller in 1869. The principal difficulty in using it is the excessive shrinkage to which it is liable when heated. Thus a cube of magnesia of 10 inch edge, in the raw state, is said to shrink to one of 6 inch edge, when sufficiently calcined. For this reason furnace linings made of this material were liable to crack badly. The remedy for this state of things is to cause the magnesia to undergo its maximum possible contraction before being placed in the furnace, but for this an excessively high temperature is required. These difficulties have, it is claimed, been overcome, and M. Lencauchez showed the Paris Society of Civil Engineers a number of perfectly solid bricks of magnesia, which were as dense as granite, and had been thoroughly shrunk. On analysis the bricks are found to have the following composition:

Silica	1·50	to	2·50
Alumina and iron oxide	0·75	"	1·25
Lime	1·50	"	3·00
Magnesia	96·25	"	93·25
	100·00		100·00

The high temperature required to insure that the bricks shall not be liable to further contraction is obtained by suitably designed gas kilns.

DR. BREWER, of Cambridge, making all allowance for the Chinese inventive, lying faculty, allows them to have been acquainted with the properties of the magnetic needle B. C. 1715; while the early French Jesuit priests, who had no interest in supporting any mythical stories in the land of their adoption, believe trade routes and canals to have been in existence about the same period; that a system of regular marriages had been introduced among the people; that weaving was understood; banks and bank notes in existence; gunpowder; a regular calendar reformed B. C. 1498; a knowledge of lunar eclipses, and a division of the people into classes, each wearing a dress distinguished by its colors.

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THE WAR SHIP NEW YORK.

Never before in the history of our navy has the trial trip of a war vessel attracted such general attention as was excited by the final speed test of the new cruiser New York, on May 22, when, as already noticed in these columns, the vessel proved herself in every way worthy of the great expectations she had aroused, and in the highest degree creditable to the skill of American shipbuilders. It was, in fact, this last point, more than any other, which so greatly raised the public interest in the matter, for while European nations have been for a quarter of a century competing with each other as to which could build the most efficient war ships, the United States has been doing comparatively nothing until within a very recent period. And now our first really large all-around war vessel may be said, without exaggeration, to have broken the world's record, for in her trial trip she attained a speed of 21·07 knots per hour, and her mean speed for four hours, corrected for tidal current, as given by the official report of the naval board, was "at the rate of 21 knots an hour."

The official report says: "The performance of the engines, boilers, and accessories was excellent, reflecting credit upon the builders. Nothing less than the best material and workmanship could have produced boilers and engines to stand so prolonged and excessive a strain without a breakdown in any part. Not a journal heated unduly nor was any water used on bearings except as a matter of precaution." In conclusion, the naval board having charge of the trial, of which Rear Admiral Belknap was president, "feels justified in recording its opinion that in the New York the navy of the United States will possess a vessel which, as a combination of superior speed, good armored protection, disposition of battery, excellent sea-going qualities, and rare habitability, leaves little if anything to be desired for the purpose she was designed to fulfill."

The contract price of the New York with the firm of William Cramp & Sons, of Philadelphia, was $2,985,000, and the firm receives, as heretofore stated, $200,000 for obtaining the extra speed on her trial trip, as the vessel had been designed to make only 20 knots an hour. Her length is 380 feet 6½ inches; beam, 64 feet; mean draught, 23 feet 3½ inches; displacement, 8,150 tons. Her ram bow and high freeboard are conspicuously noticeable as the vessel is seen at anchor, the 8 inch rifles she carries being 25 feet above the water. She has two of these rifles in a barbette forward on the upper deck, two in a similar barbette aft, and two are carried in broadside amidships on the upper deck. She has also twelve four-inch rapid fire guns, eight rapid fire six pounders, four rapid fire one pounders, and four Gatling guns, besides six torpedo tubes, one in the bow, one in the stern, and two on each broadside. The men working the rifles in the barbettes are protected by 10 inches of steel armor, those working the six pounders by 8 inches of armor, and the revolving conical steel shields are 7 inches thick. The sloping protective deck at the sides goes 4 feet 9 inches below the water amidships and 1 foot above, when the vessel is at mean draught, and is covered with plating 3 inches thick amidships, where the slopes have an additional 3 inch plating, making a thickness of 6 inches.

Her four vertical direct-acting triple expansion engines, for operating her twin screws, are located in four separate watertight compartments. The diameters of the cylinders are 32, 46, and 70 inches respectively and the stroke is 42 inches. She was designed to have 16,500 horse power.

The steam is supplied by six double-ended main boilers, arranged two abreast in three watertight compartments, with six athwartship firerooms. In making her run home from Gloucester, Mass., the second day after the trial, the forward engines were uncoupled and the vessel was run for eight hours under two engines and four boilers, the vessel then, under easy running, making about sixteen knots an hour.

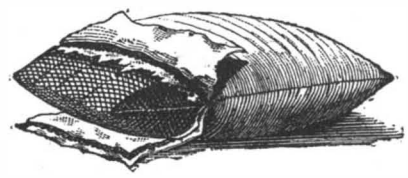
The official report shows that the power developed on the trial was as follows: Forward starboard H. P. engine, 1,328·03; I. P. engine, 1,398·73; L. P. engine, 1,568·33; after starboard H. P. engine, 1,372·86; I. P. engine, 1,369·46; L. P. engine, 1,598·24; total for the starboard engines, 8,635·65. Forward port H. P. engine, 1,318·78; I. P. engine, 1,392·09; L. P. engine, 1,459·77; after port H. P. engine, 1,295·27; I. P. engine, 1,342·46; L. P. engine, 1,503·27; total for port engines, 8,311·64: grand total of main engines, 16,947·29.

Buddhist Pictorial Wheel of Life.

The wheel of life or cycle of existence is one of the most familiar frescoes that adorn the interior of Lamaic temples. It depicts in symbolical and realistic form the fundamental doctrine of metempsychosis. It consists of a large disk with two concentric circles, the circular form symbolizing the ceaseless round of worldly existence. The disk is held in the clutches of a monster who typifies the passionate clinging of worldly people to worldly matter. In the center are symbolized the three Original Sins, and round the margin is the twelve-linked chain of causes of Rebirth, while the remainder of the disk is divided by radii into six compartments representing the six regions of Rebirth. In the upper part of the region representing hell is the Bardo, or state intermediate between death and the great judgment. Outside the disk, in the upper right-hand corner, is a figure of Buddha pointing to the moon (with a hare in it), and in the left-hand corner a figure of Chenresi (Sanskrit, Avalokita), the patron god of Thibet incarnated in the Dalai Lama.—*Journal Asiatic Society of Bengal.*

TORSION BRAIDED WIRE PILLOWS.

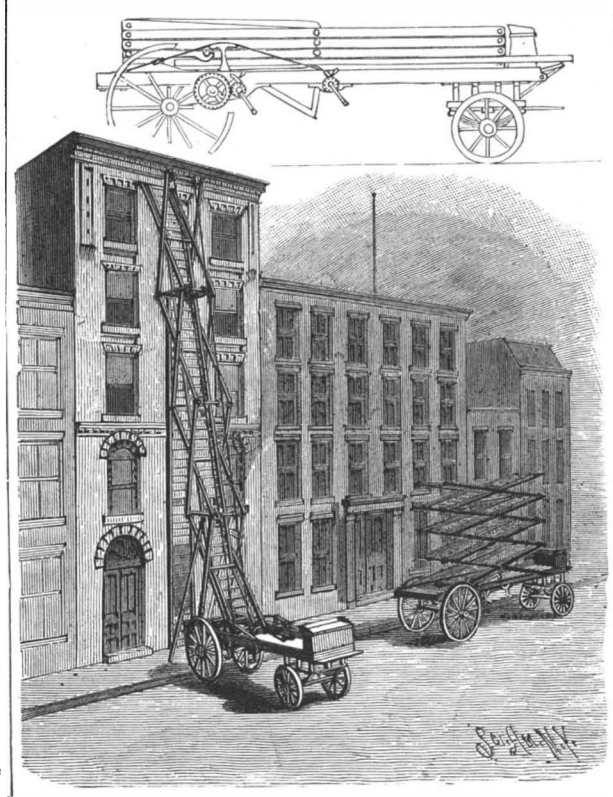
A pillow made of finely braided spring steel wire, plated to resist rust, and upholstered in closed case, as shown in the engraving, offers obvious advantages for use in warm weather, the slightest movement changing the air beneath, so that the head does not



become heated. It is especially recommended for ameliorating the discomforts of sick persons and young children. This pillow is made by the Weston & Wells Manufacturing Co., 1112 to 1116 Noble Street, Philadelphia, Pa.

AN IMPROVED LADDER AND TRUCK.

A ladder which can be quickly and conveniently handled, and raised to a great height with safety, and which may be raised in either a slanting or a vertical position, is shown in the accompanying illustration, and has been patented by Mr. Moritz Roessler, Jr., of College Point, N. Y. The improvement is designed to serve the double purpose of a fire escape and a means of facilitating the extinguishment of fires, for it can be raised on a slant as it goes up, and so saves time in moving, and hose may be attached to the ladder and carried up thereby to the windows of a building, or to an elevated platform when the ladder is raised vertically. The main view represents the improvement in position of actual use, a second truck having the ladders partially elevated, while at the top of the picture is a side view of the truck with the ladders in folded position on it. In the inner face of each of the side beams of the truck is a longitudinal groove, forming slideways for rollers on the ends of a cross rod connecting one of the lower end sections of the ladder-elevating frames. Near the rear of the truck is journaled a shaft carrying two drums, each outer end of



ROESSLER'S LADDER AND TRUCK.

the shaft having gear and ratchet wheels, and in front of this shaft is journaled a drive shaft adapted to receive crank arms on each outer end, and having pinions to mesh with the gears on the drum shaft. Adjusting arms for giving the desired inclination to the ladder are pivoted within the side pieces of the truck, the forward ends of the arms being segmental and having teeth engaged by pinions on a transverse adjusting shaft having crank arms on its outer ends. The other of the lower end sections of the lower ladder-elevating frame is connected with the rear extremities of the adjusting arms, each of the frames being of like construction, and the two sections of each frame being connected at their centers by a rod, one section fitting in the other. When the ladder is folded down, the lower end of one section of the lower frame is near the front of the truck, the lower end of the other section being at the rear, and upon the lower connecting bars of the sections are grooved pulleys, each cross rod forming the pivotal connection between the different frames being similarly provided with friction rollers, and over these pulleys and rollers pass cables attached to the drums on the drum shaft, by the rotation of which, by means of the crank arms, the ladder frames are all simultaneously elevated. The ladder itself is made in sections, located on the inner sections of the frames, and when the latter are elevated, as shown in the main view, a continuous straight ladder is formed, except for the slight outward and inward inclinations at the top and bottom. One of the frames also carries a platform, preferably pivotally attached to a cross bar of one of the upper frames, and held in horizontal position by engagement with an opposite connecting rod. When the ladder is erected, it is prevented from sagging by props from the ground connected with any one of the sections of the frames, and a rope ladder may be secured to an overhanging end of one of the frames and made to drop in front of any window desired. The ladder-supporting frames together virtually form a lazy tongs, and when the ladder has been elevated it may be given any desired inclination by turning the crank arm of the adjusting shaft.

Poison Ivy—How to Cure the Poisoning.

When you go into the country this summer don't "monkey" with all the pretty plants you may find along the wayside. Especially avoid a twining, beautiful, three-leaved plant you may find growing around the base of trees, stone walls, and old fences. An attractive plant, just the kind of glossy glitter to its bright green leaves as impels one to "just take a little of it home" with you. Don't do it, unless you are one of those few that may with impunity handle *Rhus tox.* That's the botanical name of the plant, that, familiarly known as poison ivy, has caused so much suffering to many.

The writer has suffered, and on many occasions has struggled for its cure by means of neighborly suggestions, by doctor's efforts, potions, lotions, harrowing days of dread and itch. Does it itch? Yes; you'll know when you've fooled with *Rhus tox.* by a strange itch. It's different from any other itch. You scratch it, and it seems as though you had conquered the irritation; it fooled you. You look for a cause, and find none. The skin is normal, no blemish shows, but it itches again. When you are warm and comfortably asleep, you will be wakened up scratching that same spot. You "could dig it out with your nails." You can't do it. That's *Rhus tox.* poisoning.

Soon a small, insignificant swelling lumps up where the itch is; then it begins to look watery underneath the skin, but it itches none the less, rather more. You scratch through the skin, the water underneath is released, and the nails and fingers carry the watery poison to fresh spots; possibly to the face, the ears, the body. The same tedious itching, scratching is multiplied. You are now a case for sympathy. Without means of cure, your existence is a realized sheol. I propose, now that you understand the cause and the symptoms, to tell you of the cure. It is simple, it is effective. Procure from the drug or other stores where they are sold a small bottle of little sugar pills, labeled "*Rhus tox.*" A "hair of the dog that bit you" will cure you. Take six of the little pills at one dose, four doses the first day—morning, noon, evening, and bedtime. The next day the itching will be mollified a degree. The second and third day, take three doses of six pills each dose. You will, by this time, be so free from irritation that you may carelessly take a few pills until nature heals up the sores. So soon as the healing begins, be very chary of taking many of the pills, as they will, in excess of requirement, produce an intolerable, though harmless, itching over the whole body.

The writer, poisoned on an average four to six times a year, finds this remedy a permanent check on the first appearance of poisoning symptoms. H. M.

Improved Electric Lamp.

John Waring, of Darlington, Wis., claims to have discovered that if a carbon in a sealed chamber is surrounded by a gas of great specific density, the dissipation of energy by loss of heat from the carbon is reduced, so that as a factor it may be ignored. By using as a surrounding medium a gas which has no injurious chemical effect on the carbon, the disintegration caused by high temperature and the blackening of the glass of the lamp is said to be materially lessened, while the stability of the carbon is proportionately increased. As a result, it is claimed, a lamp is produced which will maintain its efficiency much longer than a lamp having its carbon in a vacuum. These results, according to Mr. Waring, are best obtained by enveloping the carbon with a gas consisting of the vapor of bromine, or of the vapor of iodine, or of a mixture of both. The *Western Electrician* says: The appearance of this lamp at the present time is significant as indicating the direction which investigators are following in their efforts to produce a perfect incandescent lamp.

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THE NAVY RAPID FIRE GUN.

The rapid fire cannon designed by Ensign R. B. Dashiell, United States navy, having been adopted for the armament of the ships of the new navy, the following description and accompanying views of the gun and mechanism will be of interest to our readers. This design of breech closure is intended for guns of 4, 5 and 6 inch calibers, firing projectiles of 33, 50 and 100 pounds respectively. All these guns use a solid-drawn metallic cartridge case with the projectile gripped in the mouth of the case, like a rifle bullet in a small arm cartridge. Smokeless powder is used, giving velocities of over 2,500 feet per second. The gun and its ammunition are American throughout. The cartridges are made by the Winchester Arms Co., of New Haven, and the smokeless powder by the United States Naval Torpedo Station at Newport.

The fermeture of the gun is on the slotted screw system. The plug is supported when withdrawn on a hinged tray and collar of suitable shape. All operating mechanism is carried on the tray casting, except the trigger, which is on the gun.

A curved translating arm of bell-crank lever form is pivoted on the tray at one end. A vertical toe at the other end engages an undercut score in the breech plug. When this lever swings on its pivot, the plug, if unlocked, will be withdrawn from or entered into the breech.

In the elbow of this arm is pivoted a horizontal cogged segment, formed in one piece with a long lever ending in a vertical handle or grip. A curved slot in the tray allows its pivot pin to move with the pivot of the translating arm as a center during longitudinal motion of the plug on the tray. This cogged segment engages a series of horizontal cogs on a rack bar which slides in a groove in front of the tray. The left hand end of this bar is provided with vertical cogs engaging another series on the lower part of the breech plug. A stop pin on the face of the breech limits the travel of the rack. The length of the rack is such that its extreme right hand cog is immediately below the pivot pin of the translating arm when the plug is unlocked.

The usual double-acting latch is fitted to the tray.

The plug being locked, a pull on the hand lever rotates the cogged segment, thus unlocking the breech plug by means of the rack bar described. As soon as the plug is unlocked the stop pin will have checked the motion of this rack and the center of motion will be transferred to its right hand cog, which is now immediately below the pivot pin of the translating arm. Only the motion of translation can thus take place. As soon as it is entirely off the tray ribs the plug can revolve, but being then home in the breech its translating motion ceases and revolution locks it in place.

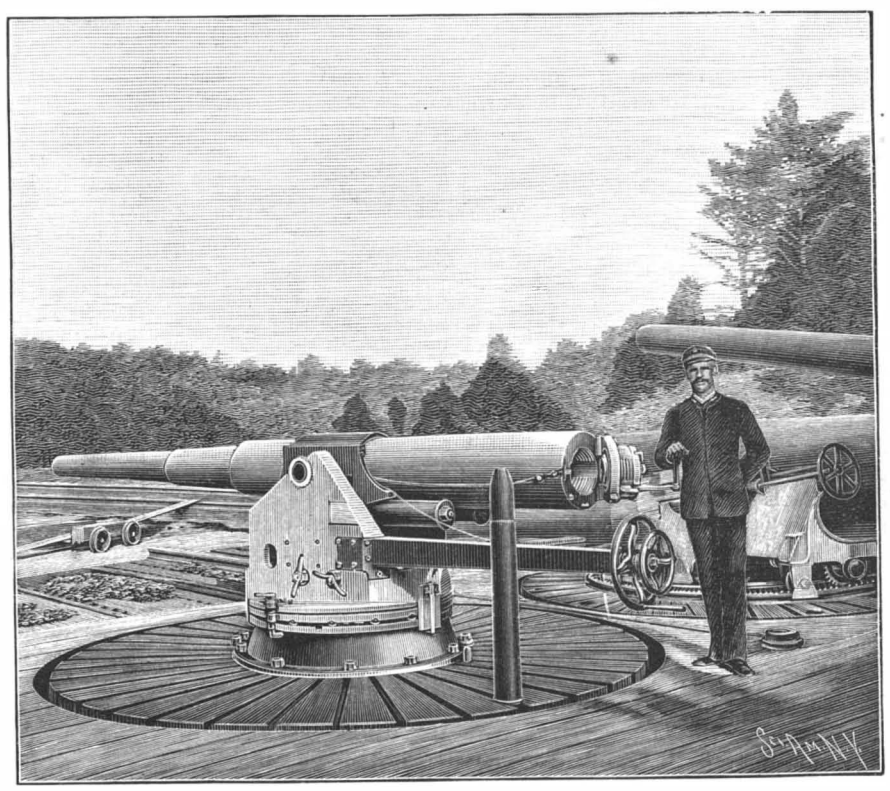
The extractor is a strong bar kept down by a mild spring. It passes through a hole in the plug so as not to interfere with the threaded parts. By utilizing a certain amount of fore and aft "lost" motion the extractor is kept from slipping off the cartridge head at the same time that the plug, when pulled quickly to the rear through this "lost" distance, acts very powerfully as a hammer to extract the empty case. The extractor is shown in its forward or pulling position. When pushing a cartridge home the extractor hook cannot rise and catch until it has been pushed back, by the forward motion of the plug, to its rear position. It can then snap over the rim of the case and is ready for the blow from the breech plug in extraction.

The firing mechanism consists of a straight firing pin with cone-shaped shoulder. A spiral spring actuates it, being held to its work by a loose, spool-shaped sleeve. A cocking lever is pivoted to the plug, its upper end running along a cam groove in the tray collar, while its lower end is forked to engage over the spool-shaped sleeve of the firing pin. When unlocking, this lever moves the sleeve to the rear, cocking the pin on the toe of a horizontal sear bar. When locking, the sleeve is given motion in the opposite direction, which compresses the spring, leaving the firing pin cocked. When fully locked, the outer hook of the sear engages the trigger. A cap over the rear end of firing pin prevents all danger from defective primers.

It will be seen that the gun cannot be fired unless the mainspring is compressed and the sear and trigger engaged, neither of which takes place until the last instant of locking.

The lanyard leads forward, around a pulley near the trunnions, if desired, so that the gun captain and lanyard will be out of the way of the gun servants about the breech, and the pull for firing will be independent of the elevation of the piece.

The advantages claimed for this mechanism are efficiency, with cheapness of manufacture. The quick-acting part is applicable to any gun with slotted screw fermeture in which the breech plug is worked by manual power.



THE DASHIELL RAPID FIRE GUN.

The following selections from the "Annual Report of the Chief of the Bureau of Ordnance" show the behavior of the gun in service:

"The recently adopted breech mechanism for rapid-fire guns of 4, 5, and 6 inch calibers have been put to a most thorough test, with both good and defective ammunition. Four-inch gun No. 11 was fired 248 times. The mechanism was worked about 8,000 times with tight-fitting cartridge cases. These cases had to be hammered into the gun, and were selected for the purpose of testing the extractor.

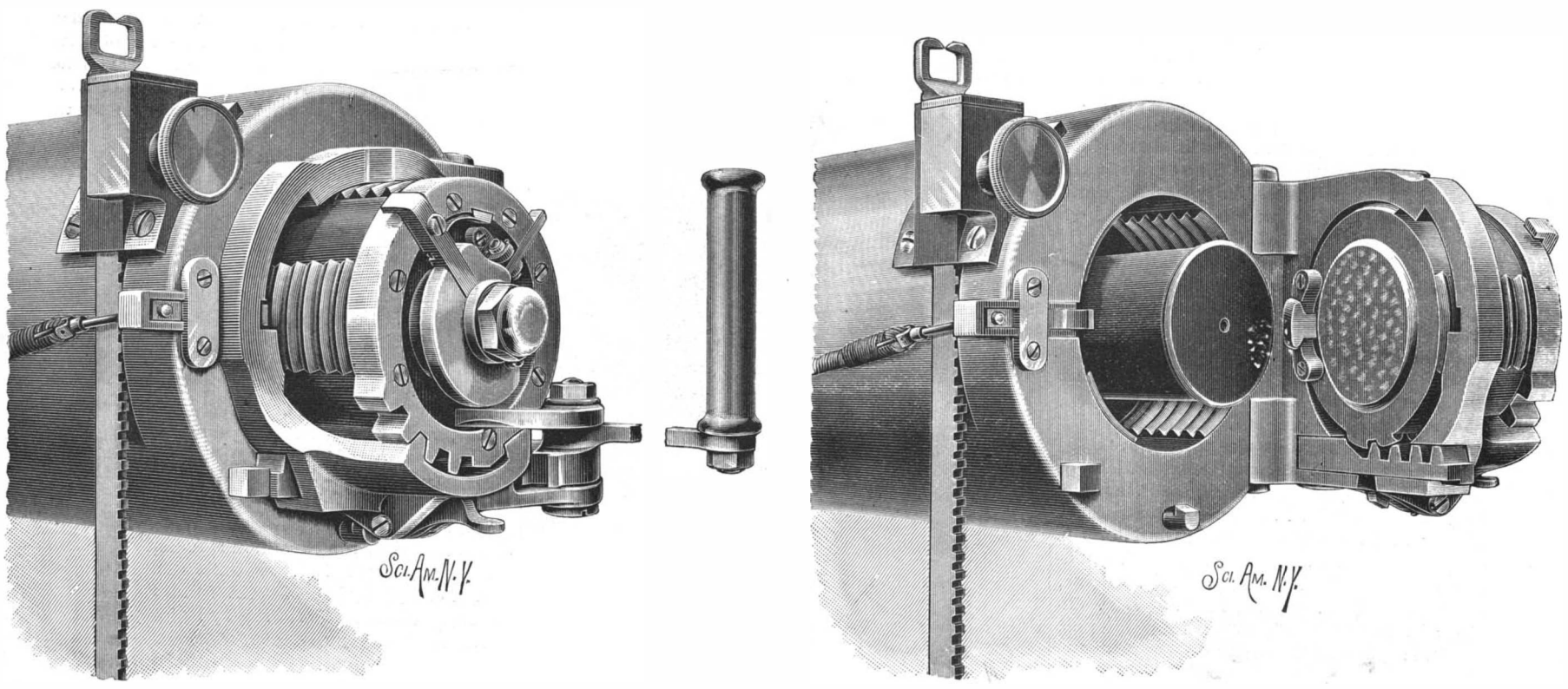
"There has been no failure in the action of any part. A test for rapidity of fire was made before the chief of bureau and bureau officers. Five rounds were fired in seventeen seconds, using experimental cases. Since then, on two occasions, five rounds have been fired in fourteen seconds. On the second trial, the gun was laid at 10° elevation, and all five projectiles were in the air together.

"Similar exhaustive trials have been held with the 5 inch rapid-fire mechanism. Five rounds have been fired, in two instances, in 19 seconds. The charge and projectile made up in one weigh 95 pounds (with brown powder) and can be easily handled by one man.

"There have been no cartridge cases as yet for the 6 inch quick-firing gun, the DeBange check being used for obturation. The 6 inch rapid-fire mechanism was tested in competition with the service mechanism by a board of which Captain J. A. Howell, United States navy, was the senior member.

"The conditions of firing were precisely similar with each gun, the elevation 3°, service carriages, gun sponged after each round.

"The gun, with the ordinary service mechanism (Mark III), was fired 10 rounds in five minutes and two seconds, while that fitted with the quick-acting mechanism was fired by the same crew ten rounds in two minutes and fifty-six seconds."



THE DASHIELL RAPID FIRE GUN.

The arm and lever consequently swing together, and the plug is withdrawn on the tray and swung to one side clear for loading. As the plug comes out a groove, cut in its threaded lower segment, passes over the central tooth of the rack.

In returning the plug to the breech two forces will be at work in the mechanism—one to rotate the plug, the other to push it home. The first is checked by the groove in the plug engaging the tooth of the rack mentioned and pulling the plug against the tray rib.

These guns will form the main batteries of the small cruisers and the secondary battery of the larger vessels of the navy.

FRENCH ingenuity has contrived an improved stone-cutting saw of remarkable efficiency—a circular saw having its edge set with black diamonds in the same way as the straight blades; but as the strain on the diamond is all in one direction, the setting can be made much firmer.

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The German Enameled Sheet Iron Trust.

Mr. Albert H. Washburn, our commercial agent at Magdeburg, Germany, in his April official report states that the depressed state of an overstocked market during the past two or three years has recently led to the formation of a trust by German manufacturers of enameled sheet iron. The avowed object of the combine is to prevent over-production by regulating the output upon the home market. Incidentally a scale of prices, rebates, and other charges are agreed upon. No attempt is to be made for the present to control the sale of exported wares, even when sold to German buyers.

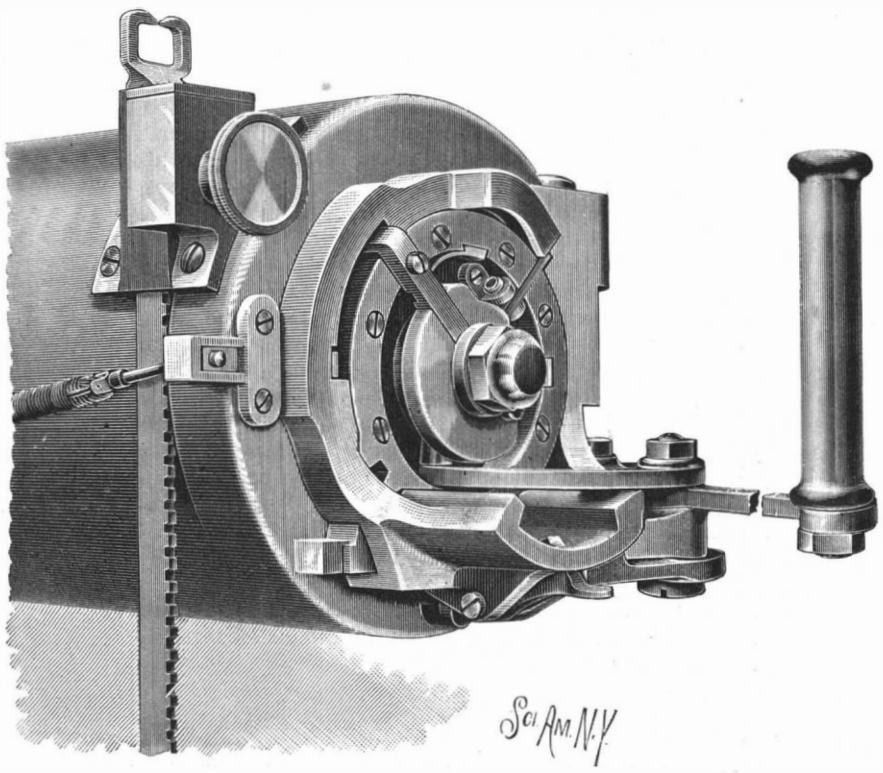
The principle upon which the new association will operate is to measure future production by the general average of past sales, with due regard to any extraordinary conditions that may arise. Thus it is supposed that the total production for 1893 will represent the average of domestic sales for the years 1890, 1891, and 1892, reckoning from January 1 to December 31. A provisional plan was adopted to this end. A committee named for the purpose collected the figures for the years mentioned and computed the average for the present year. The exact quantity to be produced by each factory was then apportioned in general meeting.

It is not proposed to effect sales through the central agency. Every firm secures its own orders, as heretofore, and is responsible for the carrying out of its contracts. Prices and rebates are for the most part constant. The only exception is where a firm is not producing the prescribed quantity through lack of orders. If this continues for a period exceeding a month, the president of the trust is authorized to permit a scale of lower prices until the limit of production has been reached. One firm is permitted to take over the orders of another, but no firms thus uniting may exceed their combined quota. If, at the end of the year, certain works have failed to produce their allotted quantity, they are to be reimbursed for the difference at the rate of 10 marks per 100 kilogrammes by those firms over-producing. This is adjusted through the central bureau. Works partially or wholly ceasing operations are not entitled to remuneration for the time so lost.

Certain checks are imposed. Pending a permanent arrangement, a committee was appointed to establish the correctness of the figures reported. Whenever a decrease in sales is ascertained, a corresponding decrease in quota is promptly ordered. Each firm is required to forward semi-monthly to the central office a statement of actual shipments. Statistical summaries based upon these reports are to be published every two weeks for the information of members of the association. After a more complete organization has been effected, the directors of the various groups making up the trust are to hold quarterly sessions to fix, with the aid of the published statistics, the production for the succeeding quarter. In this manner every firm will be enabled to estimate with some exactness the quantity it is entitled to put upon the market.

The trust is made up of the manufacturers in Rhenish Westphalia, Saxony, and southern, northern, eastern, and central Germany. Thus far about thirty works are included. Affairs are directed through a president in charge of the central office, the general meeting of members, and the directors of groups. The president and vice-president are elected for one year, and the former presides at all general and group deliberations. One vote represents an annual shipment of 100 tons or a fraction thereof, but no establishment is entitled to more than five votes. Guaranty deposits at the rate of 20 marks per ton are required to be made with the central office by each firm. In case of failure to comply within four weeks with an order to pay made in accordance with the terms of the agreement, the amount involved is drawn from the fund of the defaulting firm. The security must be replaced within two weeks. The trust compact expires December 31, 1895, until which time no detail can be changed without unanimous consent. Members bind themselves not to erect new works or interest themselves in firms outside of the trust.

The association is to devise means to prevent goods intended for export finding their way to the home market. Each group is to establish a central depot for the sale of damaged wares. The principal office is located at Berlin, and the president—Dr. H. Claus, of Thale—is a successful inventor of various new enameling processes.



THE DASHIELL RAPID FIRE GUN.

Do Ants Talk?

This query is made by a writer in the *Magazine of Natural History*, and he then goes on to say: I one day saw a drove of the small black ants moving, perhaps to better quarters. The distance was some 150 yards. Almost all which came from the old home carried some of the household goods. Some had eggs, some had what may have answered for their bacon or meat, some had one thing and some another. I sat and watched them closely for over an hour. I noticed that every time two met in the way they would hold their heads close together as if greeting one another, and no matter how often the meeting took place this same thing occurred, as though a short chat was necessary.

To prove more about it, I killed one who was on his way. Others being eye witnesses to the murder went with speed, and with every ant they met this talking took place as before. But instead of a pleasant greeting, it was sad news they had to communicate. I know it was sad news, for every ant that these parties met hastily turned back and fled on another course, as much as to say, "For the king's sake and for your safety do not go there, for I have seen a monster, just behind, that is able to destroy us all at one blow. I saw him kill one of our family. I do not know how many more are killed." So the news spread, and it was true. How was the news communicated, if not by speech?

Dangers from Gas Pipes and Trolley Systems.

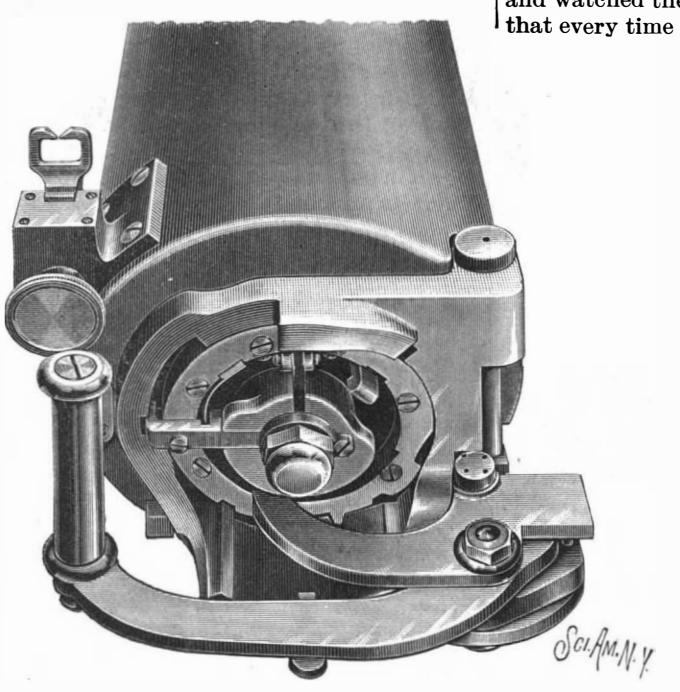
Mr. John R. Pearson, writing to the *American Gas Light Journal*, describes a peculiar accident to one of the natural gas mains, caused by the trolley system used by the Citizens' Street Railroad Company, of Indianapolis.

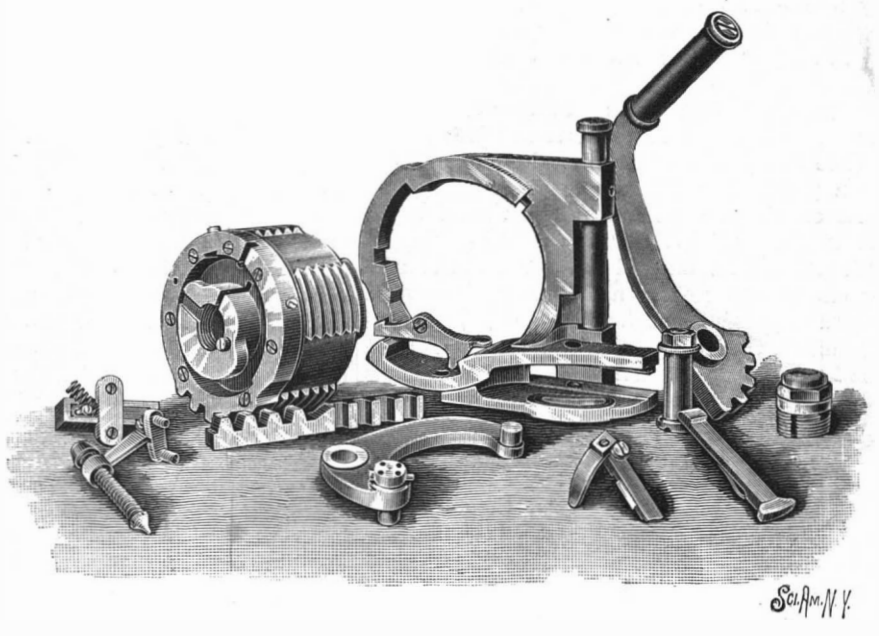
On Illinois Street the concrete and asphalt render the street impervious to moisture. Hence the earth and sand, for the distance of several feet below the street, form a very poor conductor. When the leak of electricity from the iron pole of the street car made its way to the ground, there was no way through the ground for it to return by the ground circuit to the power house. Owing to the dryness of the earth, as above described, the base of the iron street car pole being in contact with our old, abandoned cast iron gas pipe, and the fact that the iron gas pipe was corroded, as was also the street car pole, rendered the contact between the two so poor that necessarily the current, in passing from one to the other, created an arc, the same as an arc in one of the street lights.

The electric arc heat is the most intense heat that it is possible to obtain. Hence the current, in making this arc, melted the cast iron pipe, also the bottom of the street car pole, in its path to find a ground, which it did, following the cast iron pipe for about 300 feet north. At this point it encountered a wrought iron natural gas pipe, that crossed the cast iron pipe, which furnished the ground sought for by the current. The natural gas pipe was, to some extent, also corroded. Hence the current, in its seeking a ground through the natural gas main, created an arc, melting both the pipes, about the same as had occurred at the base of the street car pole. The natural gas then followed along the old artificial main, until it reached the street car pole that was melted by the arc, passed up through the center of the hollow pole and escaped into the air.

The first car that passed over and the trolley created a spark that set fire to the natural gas, the flame from which leaped into the air 15 feet, melting the main current wires in a few minutes, and stopping all cars on the line for several hours.

As all large cities are adopting the electric car system, I fear that grave results will occur to water and gas mains, unless some better means are adopted than are now used to return the current back to the generator station. In our case, it would have been a very serious matter to us if the natural gas had found its way into the cellars or basements of the large blocks adjacent instead of coming out at the top of the pole; for then there would certainly have been an explosion, with great damage to life and property.





THE DASHIELL RAPID FIRE GUN.

RAVAGES OF TIGERS.—A man-eater in India was known to have killed 108 people in three years, and another killed an average of 80 persons a year for the same period. A third caused thirteen villages to be abandoned, and 250 square miles of land to be thrown out of cultivation.

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Photographs in Colors.

With the April issue of the *Photographische Correspondenz* there is given a specially interesting example of polychrome printing by the three-color method, the three negatives having been obtained from a group of natural flowers by Herr Hruza, and the printing executed in collotype by Herr Sieger.

The example consists of a set of the three impressions, and of the combination; this latter being far better than any polychrome print which we have yet seen as made on the three-color system, and it includes such delicate gradations of tint as one would expect to require ten or twelve stones if produced by ordinary chromo-lithographic means.

The three elements are spoken of in the paper as red, yellow, and blue; but these component tints are not precisely in accordance with the system as used by Cros and Ducos du Hauron; nor, on the other hand, with the later method adopted by Ives. In both of these systems red is used as one of the colors; but while in the older plan blue and yellow were employed to complete the trio, Ives used a bluish-green and a sort of lilac as the remaining color elements. In the example before us, while yellow is still retained, the bluish color is represented by a tint intermediate between the direct blue of Ducos du Hauron and the bluish-green of Ives. On the other side of the scale, too, a sort of purplish-red is used, again intermediate between the positive red and the lilac referred to as used by Ives.

The "red" print of Herr Hruza is from a negative taken through a green light filter, while the negative for yellow was taken through a violet filtering medium, and the negative for the "blue" print was taken with an orange-colored light filter.

The set of three-color prints is especially interesting, when studied in connection with the combination. Herr Hruza suggests that the original proposal of Cros and Ducos du Hauron may be considered to have been a practical failure, mainly from the difficulty of obtaining at that time (1868) plates sufficiently sensitive for the colored lights.

As light filters, the following liquids were employed by Herr Hruza, a glass trough with parallel sides being used:

	Strength.
ORANGE FILTER.	
Cochineal red and aniline yellow	1 to 100.
GREEN FILTER.	
Malachite green	1 to 200.
VIOLET FILTER.	
Ethyl violet	1 to 200.

Color-sensitive gelatino-bromide plates were used for the orange and green, while a wet collodion plate serves very well for the violet.—*Photo. Work.*

How Straw Paper is Made.

A recent visit of a newspaper man to the straw paper mill at Chillicothe, Ill., results in the following description of how the paper is made, and as the method is very similar to that of making strawboard, the article will be interesting.

Through the courtesy of Mr. James Waterhouse we started at the straw pile and were conducted through the various processes to where the finished paper lay bundled for the market. The straw is conveyed on a long carrier from the straw pile to the cutter, which is run by a 25 horse power engine, and cut into small particles, then elevated to the upper story and dropped into two digesters, where it is cooked by the lime process.

These digesters are large iron tubs 24 feet long, 8 feet in diameter, and weigh 80 tons; it requires a carload of lime every week. The hot liquor cooks the straw to a pulp, after which it passes through pipes to a chest on the lower floor, and is then pumped through an eight inch pipe to the washing engine on the upper floor, then back down below to the half-finishing chest, whence it is again pumped up to the upper floor and passes through the coarse grinder and finishing engine, thence to the vat near the rollers, where the liquid is separated from the stock, which is gathered by a fine wire roller and adheres to the felt rollers, where it begins to assume shape. It then passes over a series of rollers at the rate of 96 to 120 feet per minute. It is then carried over 13 large drying rollers that are heated by steam, thence to two stacks of calenders of chilled steel, where the paper is finished and transferred to the reel stand and then passed to the cutter, where it is cut to any required size. It is then received by two boys, who carry it to the table where it is bundled, and the straw pile that you stood by six hours ago lies before you, finished goods all ready for the market.

The paper is manufactured by the Tompkins process. The mill is supplied with the latest improved machinery for making brown straw and colored express paper.

Some idea may be formed of the magnitude of this plant when you realize that the ponderous machinery for its operation weighs 1,000 tons, and requires three engines of 140 horse power to operate it, and three immense boilers to generate the steam, and still the power is insufficient. The company will place another engine of 100 horse power in the near future. The steam pump in the valley below the mill raises 500 gallons of water per minute.—*Shears.*

Sound.

Lord Rayleigh lately delivered the first of a series of afternoon lectures at the Royal Institution on sound, and said that the course he intended to adopt was to deal chiefly with those facts which admitted of experimental illustration possible to be given in public, also to deal with points of theory not obtainable in books readily accessible. He then caused a bell to ring in an atmosphere of hydrogen, when it gave a faint sound, which grew stronger as common air was made to replace the hydrogen gas. Sir John Herschel, who, said the speaker, had done such good work that his name should not be mentioned without the highest respect, had made a mistake as to the theory of this fact; he thought that as there was a mixture of gases, the hydrogen attempted to interfere with what the air wanted to do. Sir George Stokes had given the real explanation; in hydrogen the length of the sound wave is four times greater than in air, so the bell is four times smaller in hydrogen relatively to the wave length. It would seem at first sight that if a vacuum were only good enough, the sound from a bell in it would cease, but if he said so it would be wrong, for sound could be sent through the ether, in spite of the best vacuum that Mr. Crookes or Professor Dewar could produce. An experiment could be imagined in which a magnet was caused to make 100 or 200 revolutions per second inside a vacuum, and by means of a coil of wire outside connected with a telephone, the sound could be heard.

Gases are not essential for the transmission of sound. It will pass, for instance, through wood, as set forth in the following table:

Velocity of Sound in Wood.

Name of wood.	Along the fiber.	Across the layers.	Along the layers.
Pine	10,910	4,611	2,605
Oak	12,622	5,036	4,229
Elm	13,516	4,665	3,324
Poplar	14,050	4,600	3,444
Acacia	15,467	4,840	4,436

The effect of making sound pass along a bar of wood is much the same as if a speaking tube be used. For instance, 36 feet below the floor of the theater a musical box was playing, and in contact with it was a rod of wood, of which the upper end came through a hole in the floor. Whenever he put an empty box on the top of the rod to act as a sounding board, all present could hear it playing. When he removed the box the sound ceased, because without the box the greater part of the sound was reflected back again down the rod. A stretched string or wire, with a sounding board at each end, will convey sound upon the same principle.

Sounds may be classified, and those which are most suitable for investigating are musical; they can be continued with uniformity for any length of time, and present other advantages; in fact, it is only about musical sounds that much is known, exact knowledge being considerably limited to this class of sound. In musical sounds the vibrations are performed in a given time; they have the character of complete periodicity; after a certain interval of time everything occurs over again as during the first period of time. Galileo first discovered that with any particular musical sound the number of vibrations in a given time is a constant, and this is a principle of the utmost importance.

The speaker then showed that a musical sound could be produced by a sufficiently rapid succession of puffs of air; he employed a revolving disk with a horizontal axis, driven by multiplying gear; near the circumference of the disk was a series of holes at regular intervals apart, and passing close before the orifice of a pipe from which air was steadily issuing. The perforated disk moved 6¼ times faster than the handle by which the instrument was driven, so that the time of rotation of the lower wheel as compared with that of the upper wheel, combined with the knowledge of the number of holes in the latter, enabled the number of puffs of air producing any particular musical note to be counted. When another sound, made by a tuning fork, was brought to the same pitch as that given by the puffs of air, it was known that the number of vibrations of the fork in a given time was the same. He then exhibited the siren, the well-known acoustical instrument made upon the same principle, and explained its method of working.

Lord Rayleigh said that some of the most important discussions upon sound have forced upon its students the idea of "phase," which means the part of a vibration in which a body is at any particular time; for instance, the moon is a vibrating body in a sense, and we have the four phases of the moon. When two tuning forks of the same period are vibrating, so as to be in the same phase at the same time, the air is condensed and rarefied by each at the same time, and the sound is louder. When the waves made by one fork are half a wave length behind those made by the other fork, the phenomenon known in music as "beats" is produced, and this has somewhat inaccurately been called the "interference" of sound.

Platinum Prints in Sepia, Bartolozzi Red and Green Tones.

If a finished platinum print, obtained by cold development on platinotype paper, is placed in an ordinary uranium toning bath, the black color of the image will acquire a brownish violet tone, which, however, even in the case of a prolonged action of the bath, does not change into the well-known "Bartolozzi red" tone. The latter may be produced by the following method, described by Dr. Strakosch in the *Photo. Rundschau:* To 1,000 c. c. of the developing solution, which is used for platinotype paper with cold development, from 100 to 200 c. c. (in some cases even more) of a 4 per cent solution of perchloride of mercury is added. The platinotype is printed sufficiently deep when it is developed in the above developing bath. The prints will acquire in it a brown tone. After fixing them as usual in hydrochloric acid, and after they have been very thoroughly washed, they are placed in the following uranium toning bath:

Water	500 c. c.
Uranium nitrate	5 grammes.
Potassium ferricyanide	1 gramme.
Glacial acetic acid	30 grammes.

In this bath the prints will attain at first a fine sepia tone, which will gradually become more and more reddish, until at last the Bartolozzi red will be acquired. Various tones may, therefore, be produced according to the time for which the prints are allowed to remain in the bath. As soon as the desired tone is obtained the print is washed for about ten minutes in water which has been slightly acidified by acetic acid, when it is rinsed for a very few minutes with clean water. To produce green tones, the red toned prints should be treated with a dilute solution of chloride of iron. In this bath the tone will change at first into gray, then into olive green, and finally into a brighter green. The prints are then placed for a short time in water which has been slightly acidified with dilute hydrochloric or acetic acid, which will remove the excess of ferric salt. If the prints are allowed to remain for a rather long time in water which has not been acidified, they will lose their color, but in such a case the green tint can be easily restored by immersing the prints in ferric chloride solution.—*Photo. News.*

No. 999.

There can be no doubt that the world's record for fast passenger train speeds has been beaten on the New York Central & Hudson River Railroad in the wonderful run made May 9, 1893, by locomotive No. 999. On that day that engine hauled the Empire State Express from New York to Buffalo, a distance of 440 miles. The schedule of the train is, as we have very often said, 50·7 miles an hour, including four stops. The train was 28 minutes late in leaving Rochester, and ran the distance from Rochester to Buffalo, 69 miles, in 68 minutes, making up 15 minutes. In this part of the run one distance of five miles on a level grade was run in 3½ minutes, being at the rate of 86 miles an hour. This was from Looneyville to Grimesville; and one mile west of Grimesville was run in 35 seconds, being at the rate of 102·8 miles an hour. This mile was also level. The speed was taken between mile posts, by a stop watch, by the conductor of the train. The train consisted of four cars, and the weight of cars and passengers was 362,000 pounds; the weight of engine and tender was 204,000 pounds. We are indebted to Mr. Wm. Buchanan, Superintendent of Motive Power, designer of this magnificent engine, for confirmation of the particulars given above. The engine itself was shown in our issue of April 28, but we repeat below a few of its principal dimensions:

Cylinders	19 in. × 24 in.
Driving wheels	86 in.
Diameter of boiler	58 in.
Total heating surface	1,930·37 sq. ft.
Grate surface	30·7 sq. ft.
Weight, working order	124,000 lb.
Weight on drivers	84,000 lb.
Boiler pressure	190 lb.

Not the least remarkable part of this performance is that the sustained run of 69 miles in 68 minutes was made after the engine had hauled the train 371 miles; the run of five miles, at 86 miles an hour, was made after a run of 424 miles, and the mile at 102·8 miles an hour after 429 miles had been run. The best previous record of a locomotive with a train we believe to have been one mile run at the rate of 97·3 miles an hour. This was on the Central of New Jersey, and the engine was a Vauclain, four-cylinder compound.—*Railroad Gazette.*

HIRAM W. SIBLEY, of Rochester, has given to Cornell University $50,000 for the erecti n of a new building for the use of the Sibley College of Mechanical Engineering, founded by his father, who, with his family since his death, have contributed several hundred thousands of dollars. The new building will supply ample accommodations for the increasing number of students who come to Cornell University for training in mechanical and electrical engineering. The building will be completed before the opening of the university in September.

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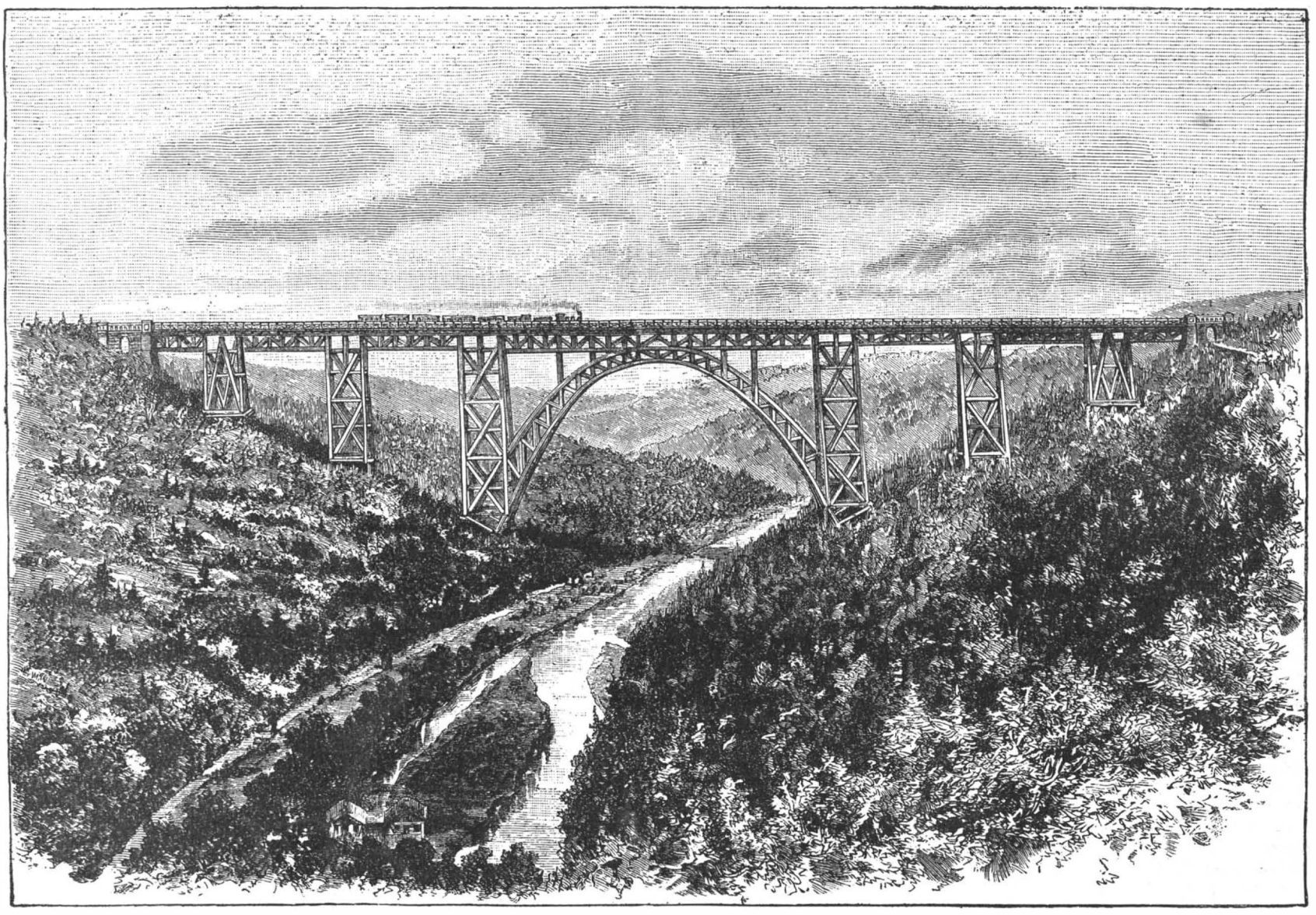
GERMANY'S HIGHEST BRIDGE.

Three hundred and fifty-one feet above the water by railroad! That is about the height of two church steeples placed one on top of the other. When the Prussian Landtag granted the right to build the Solingen-Remscheid road—a very important connecting road, not only for the iron and steel industry of the mountains, but also for passenger traffic—the foundation was laid, so to speak, for the construction of the most interesting and remarkable railroad in the monarchy.

If we start out from Solingen on this road, which is now in course of construction, a changing picture is presented to the eye. The natural difficulties have been overcome by means of a serpentine track, high embankments and deep cuts. The first viaduct, which still shows a confusion of scaffolding beams, will be 131 feet high. Our progress is suddenly stopped. Before us lies a deep valley. If we look straight across to the mountain on the other side, we discern a little fluttering flag, scarcely visible to the eye from this point. It indicates the course that will be followed by the iron horse. This is the place where the valley will be bridged over by an iron viaduct 1,640 feet long and 351 feet high.

Our engraving shows this great structure, which, when completed, will be a brilliant proof of the high attainment of German technic. A span 558 feet long, with a gigantic elliptical arch, forms the bridge proper, and at each side there is a number of strong pillars which are connected with one another by iron work. All of the iron work together will weigh 4,100 tons. The end supports, each of which is arched to form a passage for a road and the single supports, all of which are founded on solid rock, comprise 13,080 cubic yards of masonry. The cost of constructing the double track viaduct is estimated at about $535,500. The work has been begun, but will not be completed for two years. The preparatory work is very extensive. It will be necessary to build first a temporary bridge 98 feet high. The material will be transported by means of a wire rope road, and the separate parts will be raised, by means of hoisting apparatus operated by electricity, to the dizzy height where they will be mounted. So much for the bridge.

Keeping the goal of our wandering in view, we follow the line through deep valleys and over high hills, and finally we pass, mentally, through a steep, curved tunnel, which brings us to the end of the road, at Remscheid, a town noted for its iron and steel industry. The road is only seven miles long.—*Illustrirte Zeitung.*



THE HIGHEST BRIDGE IN GERMANY ON THE SOLINGEN-REMSCHEID R.R, NOW BEING BUILT.—FROM PLANS DRAWN BY ARTHUR RIEMER.

Dumb Waiter Shafts.

A correspondent asks the editor of the *Real Estate Record and Guide*, of this city, "for information as to how dumb waiter shafts should be constructed. My understanding of the law is that all such shafts which extend through more than three stories must be inclosed with walls of brick or with a suitable framework of iron filled in with burned clay or other fire-proof material, carried three feet above the roof and covered with a metal skylight, and that the openings must be provided with fire-proof doors. I know of five-story and cellar flat houses, recently built, in which the dumb waiter shafts on three of their four sides are constructed of wooden studs filled in between with burned clay tiles, this construction extending from the cellar floor to the extreme skylight top above the roof, and the doors in same on the several stories are of unprotected wood. The shafts are plastered inside and outside, and above the roof line are covered on the outside with sheet iron. If the method described is lawful or is allowed by the Department of Buildings, then many of us have been building better than required."

The law governing the construction of dumb waiter shafts is stated quite correctly in the above letter. It seems almost incredible, the editor adds, that any one should construct a dumb waiter shaft, extending through six stories, with wood studs instead of an iron framework, and with unprotected wood doors instead of fire-proof doors. The consequences that might follow ought to deter an architect from specifying or a builder from executing work that is in so gross violation of law. The expense of removing the unlawful construction and replacing it with what is lawful, costly though it would be, might prove to be the least of the troubles for the wrong-doers, when detection comes. In case of loss of life from fire in the building, an official investigation would locate the responsibility, and the person or persons guilty of the violation of law, or having allowed a violation, would be punished by imprisonment, and this would be more serious than the payment of a penalty or the cost of replacing the shaft, as the building law provides. Included in that responsibility for the loss of life would be the builder or owner, the district inspector of buildings and the architect. The lessons of the past are sufficient to teach builders that it does not pay to violate the building law; that it is better, in good faith, to carry out every requirement rather than to evade any requirement. It doesn't pay to do wrong in any business, least of all in a builder's. One of the most important of the provisions in the building law is the requirement that elevator and dumb waiter shafts shall be fire-proof. In case of fire in the lowest story the shaft acts as a great flue to carry off the hot and blinding smoke and flames past the upper stories and out through the thin glass of the skylight into the open air, thus giving the inmates of the burning building a better chance to escape and the firemen a better chance to extinguish the conflagration. If the shaft be constructed with wood studs and something else, the intense heat quickly peels off the plaster, and in a very few minutes there are lines of blazing wood from the cellar to the roof communicating with every floor, and the whole building is doomed. The proper construction of shafts for dumb waiters and elevators and shafts for light and ventilation is deemed very important by underwriters, and we doubt whether any insurance company would take or continue a risk at any price on a building where it was known that the shafts are built in violation of law.

Cement for Steam Packing.

Portland cement is mixed with sufficient water to form a stiff paste, so that when applied to a wall it will not fall off or run. This cement may be used for manhole lids with excellent results. It is applied to the carefully cleaned surfaces in a layer of from 5 to 8 mm. in thickness. As soon as the cement is applied the lid is carefully put upon it and slowly tightened until the thickness of the layer is reduced to from 3 to 4 mm. After an interval of several hours the cement begins to set, and now the nuts on the lid are firmly screwed down. During the next eight hours the joint is kept slightly moist, so as to prevent hair cracks. A manhole packed in this manner never becomes loose. In a similar manner flange joints on water, steam, or air pipes may be tightened by means of cement. Such joints, if carefully prepared, prove exceedingly durable, and are much cheaper than India rubber or asbestos packings.

Cleaning of Street Car Rails.

In a paper recently read before the English Society of Engineers, by Mr. H. Conradi, he said that the tractional resistance between clean and dirty rails varied as much as 30 lb. Cleaning by hand once a day costs 25 cents per mile of single line, in fine seasons, and twice as much in bad weather. Watering by cart twice a day costs 60 cents per mile. Cleaning by a special device successfully used on the tram cars of Reading, England, for the last eighteen months, costs 12 cents per day, and even less.

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RECENTLY PATENTED INVENTIONS.

Engineering.

STEAM ENGINE REGULATOR. — Frederick W. Mount, St. John, Canada. This invention relates to governors adapted for use with engines operated in pairs, and provides a simple attachment to the ordinary shaft fly ball governor by which the cut-off of either of the engines may be accurately regulated and each engine thus made to do its appropriate part of the work. The regulator and governor are so arranged that they may be operated without stopping the engines, so that in case of a hot box or other slight injury to one engine a greater part of the load may be lifted to the other without interfering with the work.

HYDROCARBON BURNER.—William A. Minteer, Peachville, Pa. This is a device adapted to convert a spray of steam, oil and air into a hydrocarbon gas and burn it in a combustion chamber. The burner is inexpensively made, easily controlled, and not liable to get out of order, and the arrangement of parts is such that the oil, hot and cold air, and steam, may be controlled by the several valves so that just the right proportions of each shall be admitted to the combustion chamber in steady streams, to be mingled and burned in the most efficient way to produce intense heat.

Railway Appliances.

CAR COUPLING. — George H. Conrad and Adam Winter, Pittsburg, Pa. With this device the coupling of meeting cars is automatically effected, and the uncoupling may be performed from the sides of the cars. The coupling is composed of but few parts, which are easily assembled and of great stability, and it can be used in connection with the ordinary pin couplers. The invention covers a peculiar arrangement and combination of parts, embracing several novel features.

CAR TRANSPORTATION CARRIAGE. — Alexander Bowie, Gallup, New Mexico. This invention relates to gravity plane railroads, and provides a carriage adapted to travel on the inclined track and receive a car from a side track for transportation on the plane. It has two truck frames connected with each other either rigidly or pivotally, so that in the latter case the rear or lower truck can assume a different angle relative to the incline of the track. Means are provided for regulating and controlling the velocity of the carriage moving on the plane.

Mechanical.

DIE PLATE.—Lewis C. Wetzel, Bellefonte, Pa. This die plate is provided with revoluble dies, each having in its periphery independent cutters, guide disks carried by the dies having in their peripheries recesses registering with the cutters. This improved die plate permits of quickly and conveniently changing the revoluble dies for different sized work, and removing the individual cutters of each die plate if worn out or broken, without disturbing the rest.

TOOL FOR TURNING PIPES, ETC. — Gustaf Englund, Seattle, Washington. A pair of pivoted jaws crossing each other is provided with slots, a handle being pivoted to the rear end of one jaw, and another pivot at the end of the handle adapted to move in the slots of the jaws. The improvement forms a convenient tool to effectively grip a pipe, axle, or other article, for use as a pipe wrench or for turning car axles to move the cars on the track.

NUT LOCK. — Michael F. Deininger, Brooklyn, N. Y. According to this improvement a locking nut screws in an opposite direction to the nut to be locked, and an interior polygonal flange formed on the locking nut engages a circular part on the nut to be locked. The device is simple, durable and very effective, and designed to securely lock axle nuts in place.

GRINDSTONE ATTACHMENT.—Jesse M. Clock, New York City. The stone is, by this invention, provided with a treadle mechanism, by which it may be easily turned by the foot, and the water, stone and tank attachments are so arranged that the stone may be kept thoroughly wet but will be prevented from spraying water on the person using it, while there are also bracket attachments by means of which certain forms of knives, such as those in the cutter bar of a mowing machine, and other forms of cutters, may be readily ground on a true and uniform bevel.

CLOTH STRETCHER AND DRIER. — William Bailey, Brooklyn, N. Y. This is a machine especially designed for stretching and drying shade cloth after the sizing has been applied to it. Its construction is such that the cloth may be quickly attached and will then be conveyed in a circuitous route through or over drying apparatus, the cloth being automatically stripped from the machine when it has been properly stretched and dried. A tank holds the sizing material, a regulated quantity of which is applied as the cloth is passed through sizing rolls.

Agricultural.

PLOW AND CULTIVATOR.—Madison A., William C., and Robert L. Randolph, Summerville, Mo. This is a combined gang plow and cultivator, designed to be very effective in operation, arranged for shallow or deep plowing, and adapted to be quickly changed from a gang plow to a cultivator and *vice versa*. To adjust the plow frame it is only necessary for the driver to move a lever in convenient reach of his hand, at the same time moving another lever with his foot, by which means the plows may be readily adjusted to the height desired.

SPRAYER FOR VINES, TREES, ETC. — Albert G. Provine, Puyallup, Washington. A hollow, tank-forming roller is journaled in a frame on which is mounted a pumping mechanism connected with pipes from the interior of the roller, while pipes extending along the sides of the frame are provided with spraying nozzles. The pumping mechanism is actuated by the drawing of the machine over the ground, to spray over vines, trees, and other vegetable growths a liquid solution for exterminating or destroying insect pests.

FRUIT GATHERER AND PRUNING IMPLEMENT.—Silas Chambers, Waco, Texas. This is a device having a pair of shears and a bag to receive the fruit attached to a long wooden handle, one blade of the shears being operated by a cord to cut off the fruit, which falls into the bag. The latter is detachable when the implement is to be used for pruning, and when the limbs are too thick for the use of shears they may be removed and a saw substituted.

Miscellaneous.

BRICK KILN. — Robert Garret, Freedom, Pa. This kiln is of simple construction and has a combined up and down draught designed to thoroughly circulate the heat among the ware in such manner as to quickly and evenly burn it at all parts of the kiln. The kiln body is preferably circular in shape, and beneath an air-tight floor are independent flue sections with bridge walls, forming heat chambers, each flue section connected with a furnace and communicating with vertical flues discharging into the interior of the kiln. A down draught is provided for by flues in the side walls, and the construction is such that the damp air may be drawn off from each kiln chamber during the operation of filling and during the time the green ware is in the kiln.

ARTIFICIAL FUEL.—Cornelius Cronin, Kingston, and Gwilym Edwards, Edwardsville, Pa. This is a fuel composed of several ingredients moulded or compressed into bricks, blocks or lumps, for use in stoves, furnaces, etc. Among the ingredients are specified proportions of culm, limestone, wood pulp and crude petroleum, the ingredients being ground together and a variable proportion of water added to facilitate the adhesion and mixing of the mass.

LOG PULLING APPARATUS.—Edmund M. Ivens, New Orleans, La. This is an apparatus especially adapted for pulling heavy logs out of swamp lands into lagoons or bayous. It comprises a movable platform carrying a driving mechanism and winding drums with independently operated brake devices, and fixed swamp or anchor sheave with pull rope, rope laying devices, and various other novel features. The apparatus is more especially designed to facilitate handling heavy cypress logs in Louisiana swamp lands.

AXLE BEARING AND HUB.—William D. T. Travis, Burlington, N. J. This improvement provides an improved connection between the axle bearing and the wheel, and forms a simple bearing which may be readily attached to either a new or an old axle, making it very strong, easy running, self-oiling, and very durable. It comprises a shaft chest adapted to be secured to the axle, and having means of supply at its upper side and a vent on its lower side, boxes being held removably within the chest, and a spindle turning in the boxes having one end projecting from the chest, the wheel hub being made fast to the spindle.

TURPENTINE TOOL.—Walter Watson, Fayetteville, N. C. This is a combination tool, comprising a double hacker and puller in a single instrument. It has a flat blade with its ends bent toward each other to form hackers, while the shank has a head at the lower end of which is a seat and a transverse rib at the upper end, the blade being detachable and reversible.

MOVING TRUNKS ON STAIRS.—William H. H. Hallock, West Hampton, N. Y. This improvement comprises a pivoted stair railing, with balusters having a rotary movement, and locking devices whereby the railing may be held perpendicularly or carried to a horizontal position in engagement with the steps of the staircase. Other novel features are also included, constituting a device which may be readily placed and locked upon the stair steps to form a rolling support whereby one may readily move a trunk or package up and down stairs.

RAIN WATER CUT-OFF.—Mathias A. Laska, New Orleans, La. A swinging pipe, adapted to receive water from the rain spout and deliver it to the cistern, is so connected with a counterbalanced lever and an open water-receiving vessel that the latter will receive the first water washed from the roof, with the dust and dirt which may be washed off at the commencement of a rain, such water being directed away from the cistern, the flow being directed to the cistern after the water has become clean.

GUARD FOR DOORS, WINDOWS, ETC.—Laurence F. Ryan, New York City. This is a light frame device consisting of two telescopic folding sections, adapted to be readily fitted within a door or window opening, and constitute a barrier which will effectually prevent children from getting out. It is inexpensive and quickly fitted in place, and when not in use may be folded to take up but little room.

FIRE EXTINGUISHER FOR COTTON GINS.—Edward Northcraft, San Marcos, Texas. The gin, according to this invention, is provided with sliding valves for closing the top inlet and the lint chute, the valves being so connected that they may be promptly closed by the operator, whereby any fire within the gin will soon die out for want of air.

CONVERTIBLE FINGER RING.—Louis Gumbart, New York City. This is a ring made in sections, each section being capable of being employed as an earring, but the ring having the appearance of an ordinary ring when the sections are united. The changes may be quickly and easily made from one form of ring to the other.

SNUFF BOX.—Charles L. Powell, Weatherford, Texas. This is a device more especially designed for the use of those who take snuff by brushing it across the teeth, as is done in some sections of the country. The box has a brush-holding chamber, within which is a spring-pressed plunger, whereby the handle of the brush is pushed out when the box cover is removed, so that the user may always have the brush ready on opening the box to take snuff.

EASEL. — Maurice Schmirk, Fayette, Mo. A simple and durable easel, for the use of painters and others, has been provided by this inventor, the easel being readily adjustable to any desired angle, or extended for supporting large canvases. It consists of a rack pivoted on a stand, while an extension rack is fitted to slide on the main rack, and has fastening devices for locking a picture frame in place.

SPECULUM.—Henry Dickinson, Jr., Chappaqua, N. Y. This instrument has independent upper and lower sections, with means whereby the anterior ends of the sections may be made to diverge, either one more or less than the other, or both alike.

PUZZLE.—John C. Fields, Meadville, Pa. This device consists of a skeleton box or basket having open top and sides, in which is located a series of blocks having their faces in two colors, each block bearing the same colors, and the blocks having their faces further provided with one or more indicating marks colored to register with the same, the opposite, or the adjacent faces. The puzzle consists in causing similar faces only of the blocks to be presented by simply moving the blocks laterally or vertically, and without turning them.

Designs.

FONT OF PRINTING TYPE.—Robert S. Avery, Washington, D. C. This is a design for a font of phonetic printing type, consisting of forty-two characters, each having a distinctive phonetic value.

PEPPER OR SALT BOX.—Joseph Walter, New York City. This is a salt box in the shape of a recessed cork, such as has been used in a tightly sealed bottle, and ornamented on the top by a perforated cap.

A further design of pepper or salt box by the same inventor consists of a representation of the neck of a bottle, with an even bottom and at the top a perforated seal.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

VADE MECUM. A work of reference for the use of architects, architectural iron workers, builders, blacksmiths, etc. Compiled and arranged by D. B. Dixon. With a comprehensive treatise on electricity. By Thomas G. Grier. Chicago: Laird & Lee. 1893. Pp. 480. Price $2.50.

The best description of this work that we can give is to state that to some extent it covers the very wide ground embraced in Haswell. In other words, it treats of a very wide range of subjects. It contains an alphabetical table of contents and will fill its place with considerable satisfaction.

SCIENTIFIC AMERICAN BUILDING EDITION.

JUNE, 1893.—(No. 92.)

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1. Elegant plate in colors, showing the residence of Joseph P. Beach at Pine Orchard, Conn., erected at a cost of $1,200 complete. Floor plans and two perspective elevations. Messrs. Munn & Co., architects, New York.
2. Plate in colors showing the handsome residence of Seward W. Jones, at Newton Highlands, Mass., erected at a cost of $9,000 complete. Perspective view and floor plans. Messrs. Rand & Taylor, architects, Boston, Mass. An attractive design.
3. A handsome colonial dwelling on Beacon Hill, Boston, Mass. Two perspective views and floor plans. A model design. Messrs. Shepley, Rutan & Coolidge, architects, Boston, Mass.
4. A Colonial residence dwelling at Montclair, N. J., erected at a cost of $5,500 complete. Floor plans, two perspective view, etc. Messrs. Munn & Co., architects, New York. An excellent design.
5. Engravings and floor plans of a dwelling at Elm Station, Pa., erected at a cost of $5,200.
6. A dwelling erected near Longwood, Mass. A modern design. Mr. Austin W. Pease, architect, Boston, Mass. Floor plans and perspective elevation. Cost about $2,300.
7. The First Congregational Church at Plainfield, N. J., erected and furnished complete at a cost of $15,000. Mr. Oscar S. Teale, architect, New York City. Perspective and floor plans.
8. A residence at Beardsley Park, Bridgeport, Conn. A very picturesque design, perspective elevation and floor plans. Cost $5,500 complete. Mr. A. H. Beers, architect, Bridgeport, Conn.
9. Views showing the exterior of the twelve story Boyce Building, at Chicago, put up in thirty-nine days. The cost of the structure was $300,000.
10. The Fifth Avenue Theater, New York.—Views of the auditorium, the Broadway lobby, the Twenty-eighth Street foyer. Mr. Francis H. Kimball, architect, New York.
11. Miscellaneous Contents: New lien law in California. —An improved spring door hinge, illustrated.—To estimate brick work.—Foul water main.—An improved woodworking machine, illustrated.—An improved scaffold truss, illustrated.—Sawdust building bricks.—Some beautiful arch work, illustrated.—Mineral wool in buildings.—Wood mantels, illustrated.—Sound titles for real estate.—Durability of cedar.—Tin from tin scrap.—Improved steam heater, illustrated.

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Notes & Queries

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Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.
References to former articles or answers should give date of paper and page or number of question.
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(5137) M. S. P. asks: 1. Will the hand power dyaamo described in SUPPLEMENT 161 generate sufficient current to run the motor described in SUPPLEMENT 641? A. You can barely run it without developing much power. 2. Can the eight light dynamo be run by power from a windmill? A. Yes.

(5138) W. J. R. writes: Please tell me following in "Notes and Queries" in SCIENTIFIC AMERICAN: The question regards difference in density and resistance of the atmosphere in Mississippi Valley and Leadville, Col. Suppose a man weighs 152 pounds, and in jumping from a balloon in the State of Illinois must have a parachute 28 feet in diameter to come down safely, what size parachute must this same man have to descend from a balloon in Leadville, Col.? A. The atmosphere at Leadville being about 28 per cent lighter than in Illinois, will give a proportional less resistance to falling bodies. The parachute should, therefore, be made about 38 per cent larger area, or 33 feet in diameter.

(5139) "Devoted Reader."—Probably the best way to learn the watchmakers' trade is to apprentice yourself to a thoroughly good watchmaker.

(5140) C. B. says: Suppose 1, 2, and 3 represent three tanks filled with water of equal depth, and are each 10 feet high. Diameter of the bottom is 24 inches in each. 1 is the same area at the top as at the bottom; 2 is three times the area at the top as at the bottom; 3 has one-fifth the area at the top as at the bottom. Is the pressure (per square inch) equal on all parts of the bottom of each tank, and is the total pressure on the bottom of each the same? A. The pressure is the same per square inch on the bottom of all the tanks. The total pressure on the bottoms is in proportion to their areas in square inches.

(5141) E. S. S. asks: 1. What battery is best adapted to run a motor for the longest period that carries a 10 inch fan? A. Probably the Bunsen battery is the best. 2. I have a porous cup that has holes in it, and it is lined on the inside with cloth, and a rod of carbon is in the center, and the jar is filled up around the carbon with some kind of black stuff. How can I repair the battery so it will work, and what is the black stuff around carbon? What is battery best adapted for? A. For a filling for your porous cell, try granulated black

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oxide of manganese and granulated carbon, equal parts mixed. It can be used in a Leclanche battery. 3. What can I put in a kettle to keep it from rusting? A. Try c abonate of soda.

(5142) M. B. P. asks: 1. With a dynamo storage battery and motor, what percentage of the power put into the dynamo can be delivered by the motor? A. 75 per cent. 2. What percentage could be delivered by the motor a week after the battery had been charged? A. In a good battery the percentage of loss would be small. Probably not more than 2 or 3 per cent. 3. What are the limits of the capacity of storage batteries in amperes and volts and how determined? Are storage batteries made capable of storing the electrical current developed by 30 actual horse power? If so, for how long a time could they store such a current constantly running into the battery? A. The size and number of the plates limits the current capacity, and the number of cells in series controls the voltage, each cell being equivalent practically to 2 volts. The voltage is determined by a voltmeter. There is no difficulty in storing current equivalent to 30 horse power. The batteries will contain a working charge for two or three months with a slight loss.

(5143) E. E. W. asks how to color lantern globes green, also blue and red, and what to use for colors. A. The simplest way to accomplish this is to purchase the colored lacquers from dealers in painters' supplies. If you find this inefficient, you might use rather thin shellac varnish, colored with aniline dyes. For additional information see our Cyclopedia of Receipts.

(5144) O. D., J. E. Z., and others ask for a remedy for freckles. A. We reprint a note from the SCIENTIFIC AMERICAN for February 13, 1892, in regard to freckles: Some people are born freckled and others have freckles thrust upon them. The former class might as well accept their freckles as a dispensation of Providence, for nothing can be done for them. The latter can always get rid of their affliction by using a couple of drachms of sal ammoniac with an ounce of German cologne, the solution mixed with a pint of distilled water. Applied two or three times a day, states one of our contemporaries, it will cure the worst case of acquired freckles on record. Freckles are caused by the action of sunlight on the coloring matter in the skin.

(5145) R. T. K. asks: Will you kindly let me know, through the columns of your paper, something of the difference in the power required to tow a barge when drawn close to stern (so as to almost touch) of tug, or when let out with cable so as to be considerable distance apart? That is, what are the effects of the currents caused by the propeller of tug (and hull also) on the barge when the barge is close up? Also when side wheels are used instead of screw? A. While no exact figures can be given, the fact is well known in the towing business that the current set back by the wheel of a a tug boat directly against the bow of a barge close behind somewhat neutralizes the power of towage. Hence all stern towing is done with long hawsers, or alongside. With sidewheel tow boats, the back thrust of water from the wheels to a single barge directly astern is not so great as with a propeller; yet it is enough to prevent the practice, except where necessary by narrow and crooked channels.

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June 6, 1893

AND EACH BEARING THAT DATE.

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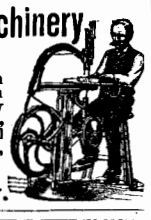

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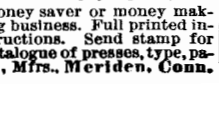

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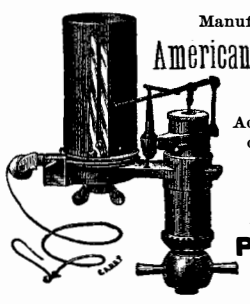

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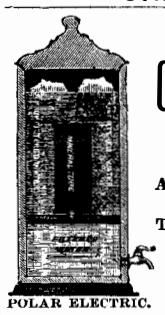

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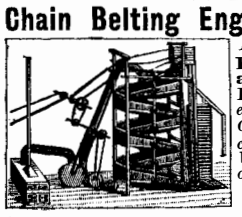

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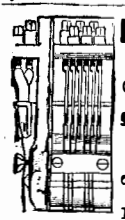

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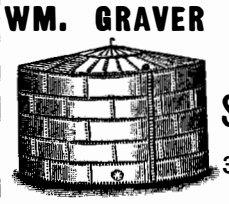

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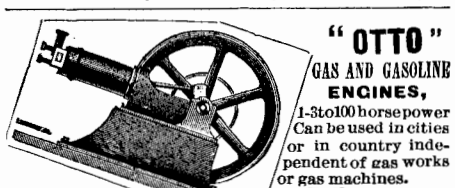

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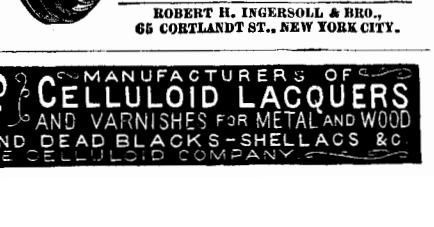

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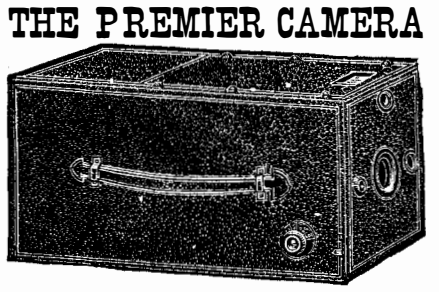

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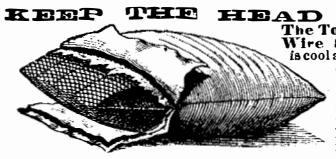

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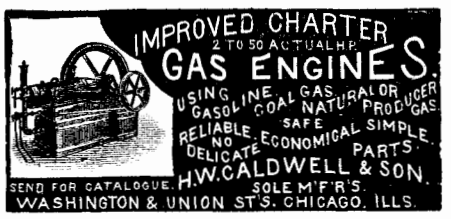

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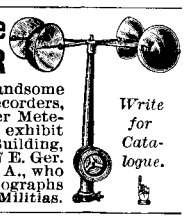

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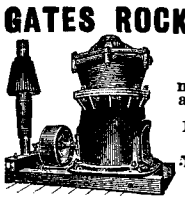

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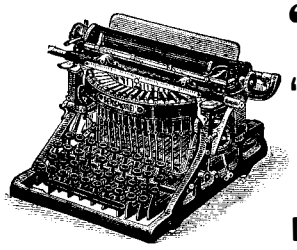

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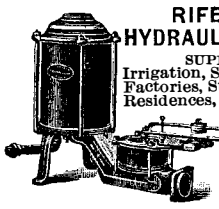

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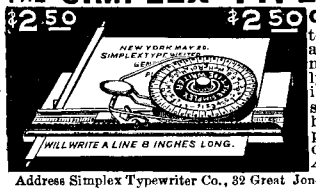

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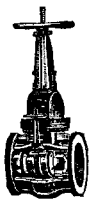

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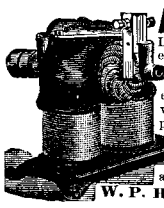

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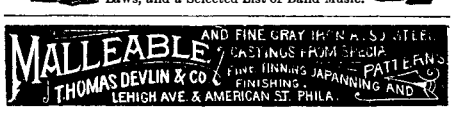
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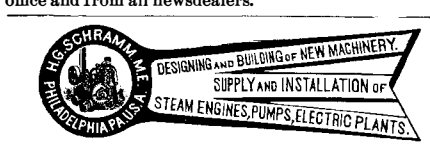
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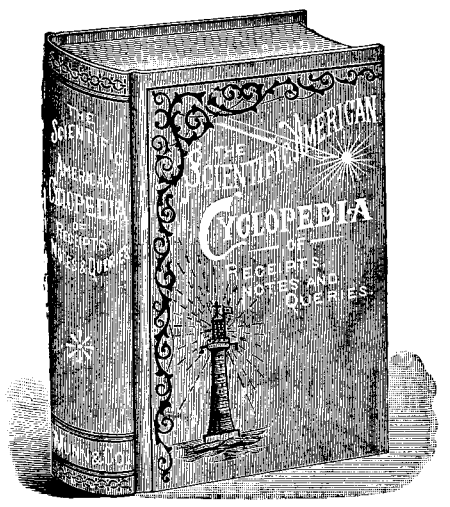

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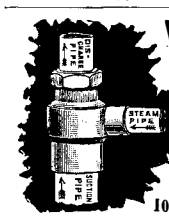

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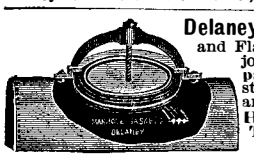

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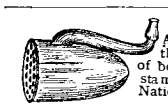

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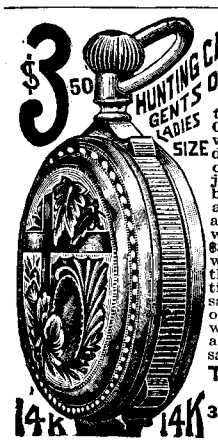

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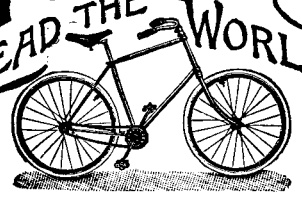

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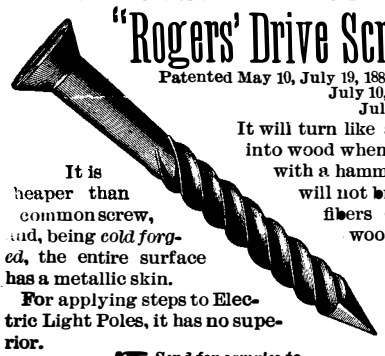

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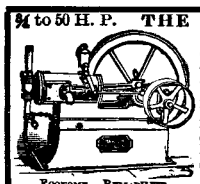

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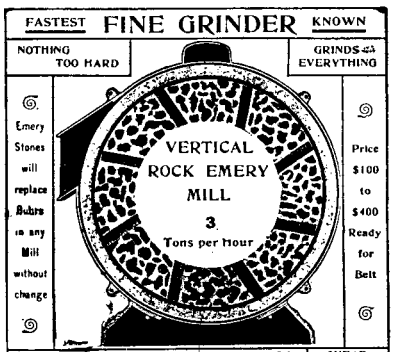

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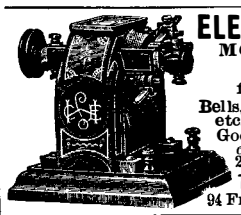

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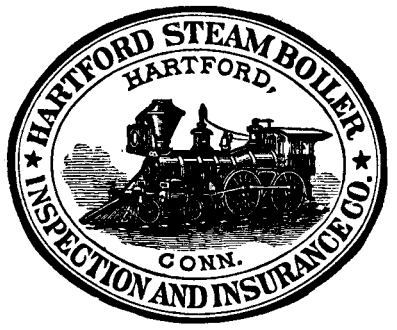

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"The patent itself is for the mechanical structure of an electric telephone to be used to produce the electrical action on which the first patent rests. The third claim is for the use in such instruments of a diaphragm, made of a plate of iron or steel, or other material capable of inductive action; the fifth, of a permanent magnet constructed as described, with a coil upon the end or ends nearest the plate; the sixth, of a sounding box as described; the seventh, of a speaking or hearing tube as described for conveying the sounds; and the eighth, of a permanent magnet and plate combined. The claim is not for these several things in and of themselves, but for an electric telephone in the construction of which these things or any of them are used."

This Company also owns Letters Patent No. 463,569, granted to Emile Berliner, November 17, 1891, for a Combined Telegraph and Telephone; and controls Letters Patent No. 474,231, granted to Thomas A. Edison, May 3, 1892, for a Speaking Telegraph, which cover fundamental inventions and embrace all forms of microphone transmitters and of carbon telephones.

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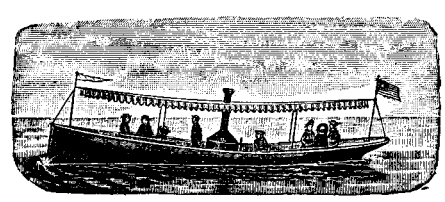

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